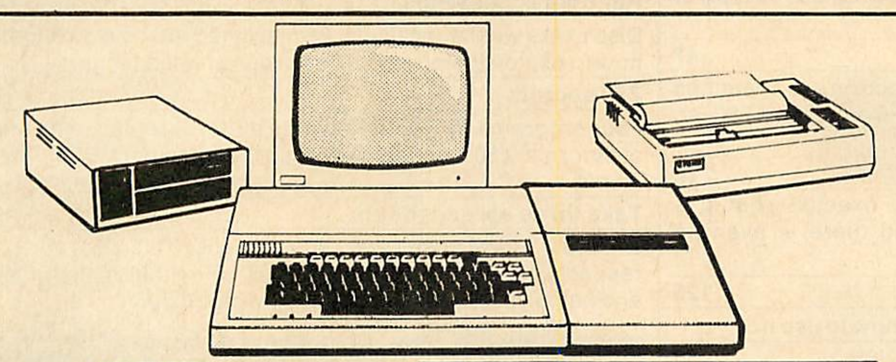

ACORN·USER
BBC MICRO · ELECTRON · ATOM
FEBRUARY 1985 £1.20
Electron add-ons: choosing your next buy
In business: round-up of spreadsheets
Modems: we test six for communications
Micro art: paint pictures on the Electron and BBC micros
Competition: win a printer worth £250 from Silver Reed
Hints & Tips: write your own database
TURTLE GRAPHICS
1984 INDEX First part in this issue
6STARS
BRIGHTNESS
OFF ON
RGB COLOR MONITOR

MICROWORLD

COMPUTER GROUP



COMPUTERS

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Aberdeen
0224 571735

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NEW USERS

ATOM

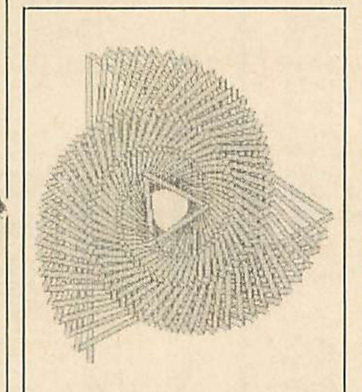
YELLOW PAGES

The major listings for this issue are printed in the yellow pages section starting on page 97. These are also available on cassette and in bar code format to save you typing them in. Details of these on pages 95 and 115



BUSINESS

EDUCATION



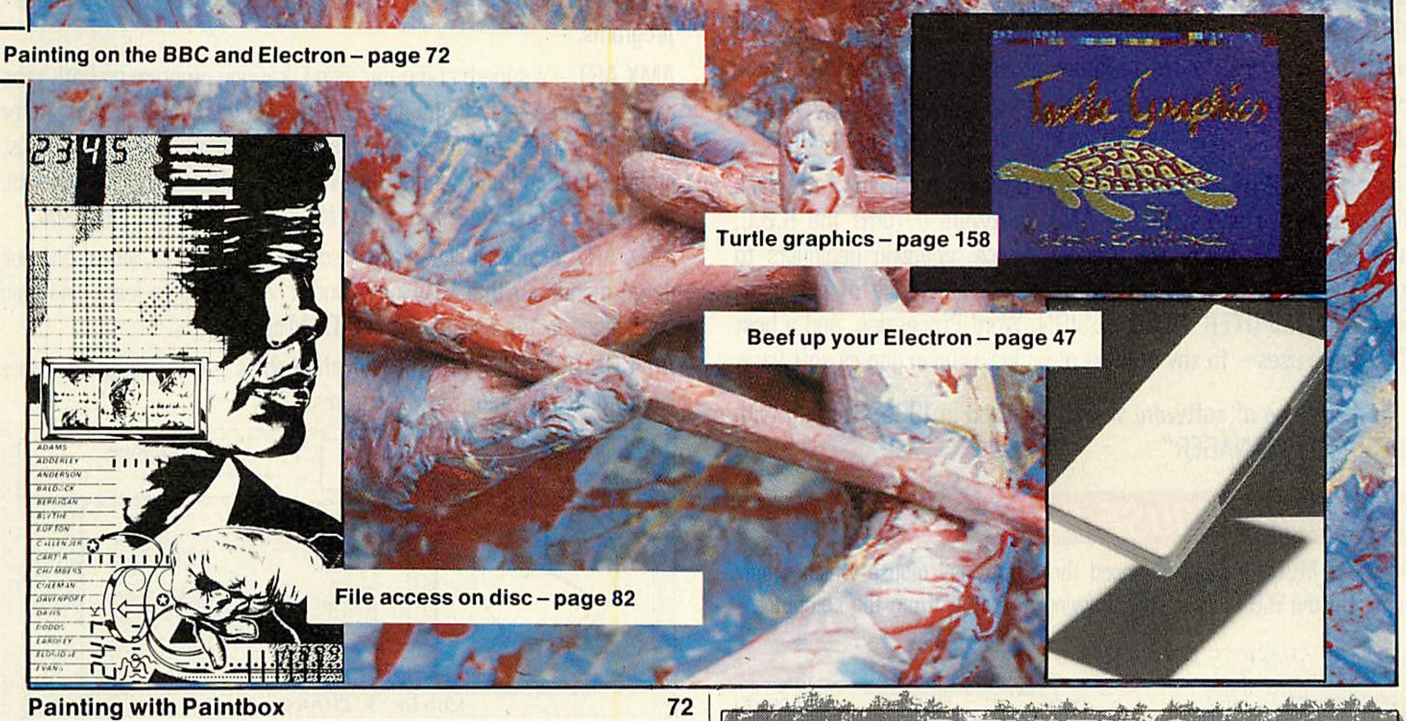
REGULARS

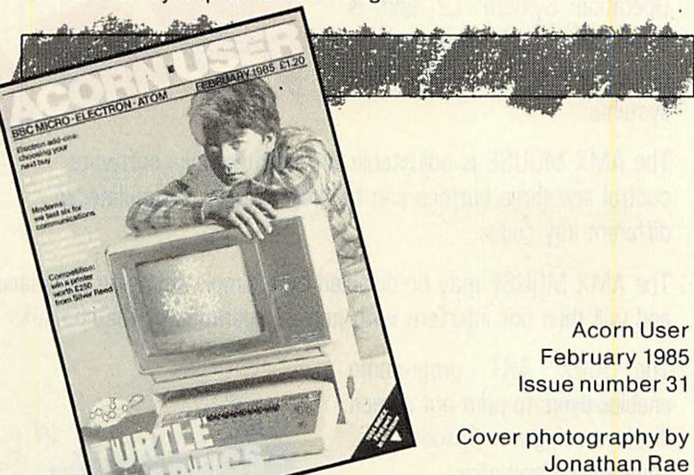
Editor *Tony Quinn* Technical editor *Bruce Smith* Sub-editor *Julie Carman* Editorial assistant *Kitty Milne* Art editor *Nigel Wingrove* Publishing director *Michael Potter* Editorial director *Christopher Ward* **Editorial** Redwood Publishing Ltd, 68 Long Acre, London WC2E 9JH. Tel: 01-836 2441. **Advertising** Simon Goode, Advertising manager, Computer Marketplace Ltd, 20 Orange St, London WC2H 7ED. Tel: 01-930 1612. **Subscriptions** Kate Evans, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Tel: 01-836 2441. Rates: UK £15; Europe £25; Middle East, Americas, Africa £30; Rest of the world £35 (prices include p&p for 12 issues). Published by Redwood Publishing Ltd, 68 Long Acre, London WC2E 9JH.

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GAMES SPECIALS FEBRUARY





Acorn User
February 1985
Issue number 31

Cover photography by
Jonathan Rae

REVIEWS

NEXT MONTH

Language guide
Forth, Logo, Lisp . . . the list is endless, but what do they do? Find out in our guide and a follow-up series on each in detail

Accounting for business

Add a second keyboard

Review bumper special

Notes for authors

Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing.
Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a day time phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.



AMX ART

AMX MOUSE

The AMX MOUSE is an advanced opto-mechanical device which brings to the B.B.C. micro facilities hitherto only available on more expensive machines. It enables you to use advanced features such as ICONS, WINDOWS, and POINTERS in your own programs.

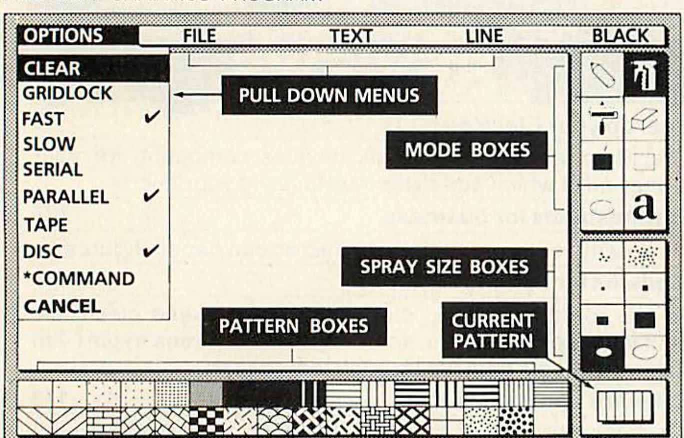
The AMX MOUSE can be used with ordinary programs to replace the cursor keys and with the AMX software it turns the B.B.C. micro into a far more user-friendly device, enabling beginners to quickly learn to use the computer for a wide range of purposes, including COMPUTER AIDED DESIGN, Word Processing, and a host of business uses – to say nothing of its inclusion in games software.

A further range of software will be released in 1985. Starting with "DESK TOP MANAGER".

THE AMX MOUSE PACKAGE

The AMX MOUSE – an advanced three buttoned mouse which simply plugs into the B.B.C. user port drawing its power from the computer.

AMX ART GRAPHICS PROGRAM



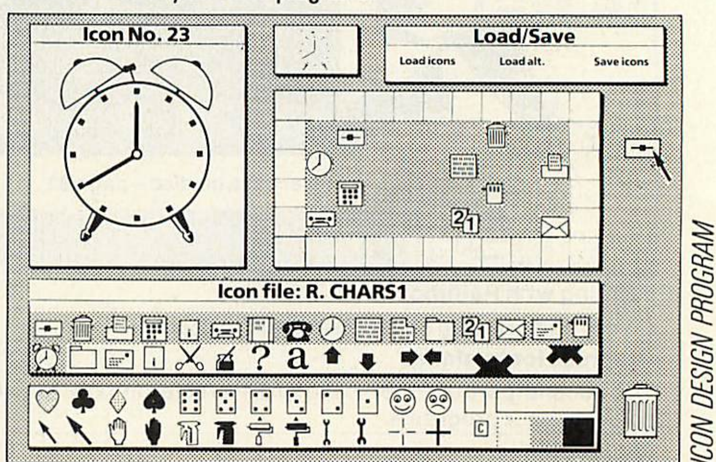
The AMX ROM – contains fast machine code routines for creating on screen windows, icons, and pointers and enables to MOUSE buttons to be programmed for use with commerial software such as Wordwise and VIEW.

A MANUAL describes how to operate the MOUSE and the ROM routines which are available in both basic and machine code programs.

AMX ART – a superb computer aided drawing program on both tape cassette and a $5\frac{1}{4}$" floppy disc with its own manual. It is suitable for a wide range of uses including preparation of illustrations, architectural and engineering detail drawings, teachers' worksheets, and just creating your own pictures. It soon becomes addictive.

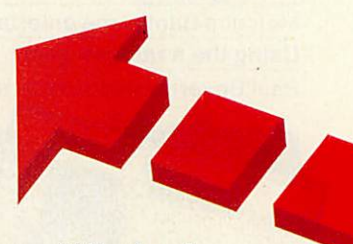
AMX ART includes full use of on screen menu boxes, icons, and pull down menus so that beginners find it very easy to learn and gain confidence in the use of the B.B.C. Micro.

An ICON DESIGNER program which enables you to create and store icons for use in your own programs.



ICON DESIGN PROGRAM

TECHNICAL REQUIREMENTS

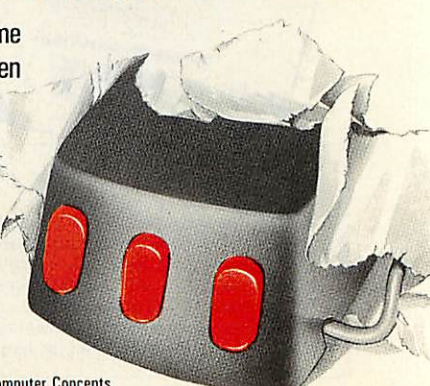


The AMX MOUSE can be used with any B.B.C. Model B computer fitted with the Operation System 1.2 and is compatible with the second processor and disc or tape filing systems.

The AMX MOUSE is adjustable for sensitivity via software control and three buttons can be programmed to simulate 24 different key codes.

The AMX MOUSE may be disabled by a simple software command and will then not interfere with normal operation of the computer.

The AMX ART programme enables users to print out screen displays using any Epsom compatible dot-matrix printer. Owners of non-standard printers may use their own screen dump routines.



Please send No.________ **AMX MOUSE** package/s (including **AMX ART** and EPROM) at **£89.95** inc. VAT and P&P.
I enclose a cheque/PO for £________ or debit my credit card. ☐ Visa ☐ Access

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Name ________________

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(Please tick choice of media for AMX ART) ☐ Cassette ☐ 3" Disc ☐ $5\frac{1}{4}$" Disc

To: Advanced Memory Systems Ltd., Woodside Technology Centre, Green Lane, Appleton, Warrington, WA4 5NG, England.

If not available from one of our main dealers, fill in the coupon and we will send you an AMX MOUSE with AMX ART with our full no quibble money back guarantee. OR phone 0925 602690/62907 for instant Access or Visa orders.

'Wordwise' is a wordprocessing program by Computer Concepts.
'View' is a word processing program by Acornsoft Ltd.

Free offer on Acorn User at WH Smith

WH SMITH is offering three free issues of *Acorn User* when you buy software or peripherals worth more than £10. BBC and Electron users will receive a voucher for three consecutive issues, normally starting with the March edition, with their purchase.

The offer has been running at all 253 branches which stock computers and software since January 2, and it ends on February 14.

BBCs needed for famine relief

OXFAM has launched an appeal through the Round Table for two BBC micro systems to help the charity cope with famine aid in countries such as Ethiopia.

The computers, plus software, are needed in the Glasgow Oxfam office, and so far Cumana, the Byte Shop in Glasgow, Silver Reed and Comscott have offered equipment.

If you can help, contact Keith McBean, Ardrossan Round Table, Rothbury, Alton St, West Kilbride, Ayrshire. Tel: (0294) 64225.



BBC SOFT has given its rivals a thing or two to think about by reducing the prices of the latest games releases (Acornsoft take note!).

The new *Dr Who* adventure will cost £7.95 while *Pantry Antics* and an arcade adventure called *Loco Motion* will be a quid less.

One program that will not be available at the new price is the new *White Knight Mk12*, which will retail at the usual £9.95. The disc version of this popular chess game, which will be second processor compatible is expected by the summer.

Opus Pocus

CONTRARY to a news item in last month's *Acorn User*, the new Opus double density disc interface, will not run all disc versions of *Elite*.

The DDFS only works with the very latest versions of the Acornsoft game. There is no way to tell which version of *Elite* you have, so Opus are offering an *Elite* upgrade service! Send a further £3, plus your old *Elite* to Opus who will return the latest release.

Pressure mounts for Prestel code

by Bill Penfold

THE headline-catching row between Prestel and one of its main information providers is certain to increase pressure for a 'code of practice' on whatever can appear on viewdata services.

The pre-Christmas bust-up was with Timefame International over claims that a 'mole' was leaking users' access codes to micro hackers.

The allegations – which were openly broadcast on Timefame's pages – were angrily denied by Prestel. When the company refused to retract its statement, Prestel shut it down.

This stunned and enraged thousands of Micronetters who regularly tapped into Timefame's bulletin board on *8181.

The wrangle continued with legal moves in the High Court, masses of protest messages from BBC users and retaliatory action by some hackers.

The situation was finally resolved when Timefame withdrew its charges and halted its legal action. Prestel then restored the frames.

Just a storm in an acoustic coupler you might think. But the row revealed the way Prestel reacts to accusations – by throwing people off the system.

And that carries far-reaching, and worrying significance for the service as an uncensored form of mass communication.

For the trouble with Timefame followed the autumn bust-up which also found the Labour Party's service being suspended.

That disagreement was eventually sorted out after the government made it clear that it wanted the viewdata industry to draw-up its own guidelines.

Now Prestel is likely to argue that disagreement with Labour and the trouble with Timefame were totally different. But editorial freedom is at stake. Is it right that Prestel can effectively censor anything it does not like?

This was the point Labour Party technology spokesman, Dr Jeremy Bray made when challenging Prestel over Labour's service.

He wrote to British Telecom (which runs Prestel) chairman Sir George Jefferson asking him to explain under what authority he had acted.

Dr Bray complained: 'The fact that an effectual ban had been imposed and allowed to continue for an indefinite period, created a presumption in favour of censorship which is disturbing in a free society.'

Subscribe to a bargain

FIRST the bad news: as you will already know if you've bought this issue, the price has gone up to £1.20. Now the good news: subscriptions will stay the same at £15 a year in Britain. So the motto is 'subscribe now.'

This is the first price rise in the two and a half years *Acorn User* has been published, and is still cheaper than anything approaching the title 'competitor'.

Also Redwood Publishing is lobbying the Government to try to ensure VAT is not levied on magazines such as *Acorn User*, as some are predicting in the spring Budget. So our second message for 1985 is 'lobby your MP to block the VAT plot – or subscribe now and beat any possible increase'.

Computer show free for teachers

THE High Technology and Computers in Education Exhibition will be held at the Barbican in London on January 23-26. This exhibition is for teachers and others involved in computer education, for whom entrance is free.

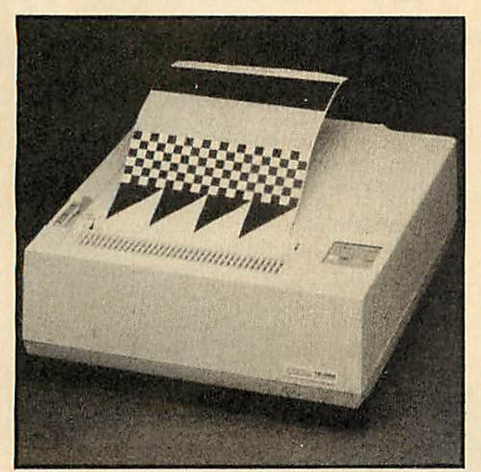
Over 200 exhibitors are expected at the show, including Acorn, MEP, and MUSE. Acorn will be promoting Econet as a low-cost local area networking system, ideally suited for schools. Also on display will be the Acorn interactive video system and the Music 500 synthesiser.

The MEP will be showing its touch screen input device for the Beeb. This sits on the front of a standard Microvitec monitor and lets even very young children interact with a computer. In the words of a MEP spokesman: 'We hope to make the qwerty keyboard redundant'.

Tired of typing? The Addison Wesley bar code reader makes entering *AU* listings a pure pleasure. It will receive its first public showing on the Bookwise stand.

The show is open to teachers 1-8pm on Wednesday 23, 11-8pm on Thursday and Friday and to the general public 11-6pm on Saturday 26.

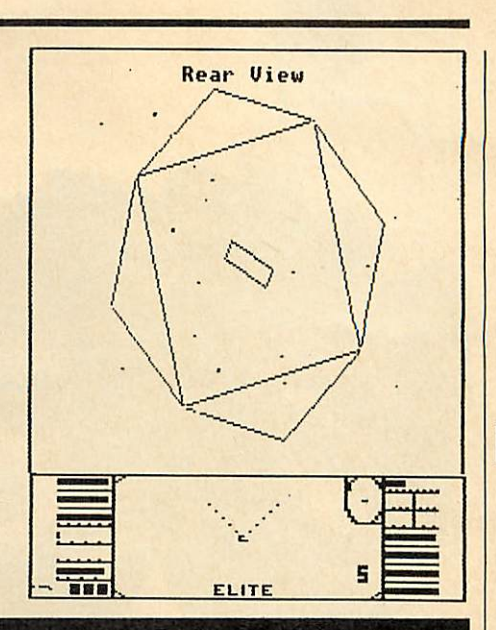
The future of printing – from video


Axiom – and its dump of Elite

THE Axiom TX1000 printer can produce high resolution screen dumps yet it needs no special software, no printer interface and it will work with most makes of computer. It plugs straight into the video output of the BBC and at the press of a button will copy whatever is displayed on the screen onto paper.

The printer uses a thermal printhead and takes about 3 seconds to print a full-size image of the screen on 8.5in paper. Resolution can be switched between 40, 50, 80 or 160 dots per inch.

Now for the bad news. . .the TX1000 costs £3365 (excluding VAT). There is a smaller version of the Videoprinter, the EX855, which uses 5in paper and costs a mere £1499, again excluding VAT. Both models are distributed by Thane Systems Ltd on (084421) 5471.



Firebird takes on 'Elite' and plans expansion

BRITISH Telecom is to produce versions of the top-selling space game, *Elite*, for non-Acorn machines.

Firebird, the software publishing arm of BT, has bought the Z80 rights to the game for an undisclosed sum and is to convert the game to run on Z80-based machines such as the Spectrum, Amstrad and the MSX clones.

Meanwhile, Firebird's strategy of selling Beeb software for just £2.50 seems to be paying off. Sales are running at 100,000 per month, says Firebird, and the company is to release further low-price titles. *Elite*, however, will be more expensive, as will Firebird's planned business and education software.

Said Andy Emerson of BT: 'We're absolutely delighted with the success of the 25 titles we've released so far. Following our lead, prices are falling all around, which suggests that profit margins were too high before.'

Viewers of December's *Micro Live* on BBC TV will have seen Firebird's *The Hacker* game. Also on the programme was a real-life hacker claiming responsibility for rifling Prince Philip's Prestel mailbox – see January's *AU*.

Prestel is also run by BT which was playing down the connection. Andy Emerson said: *The Hacker* is just a light-hearted game. We're not condoning what that person did.'

Bar code software sources set to expand

PROGRAMS in bar code format are to be distributed through regional information centres by the Government-funded Microelectronics Education Programme (MEP).

This follows the recent publication of booklets of bar code listings by *Acorn User*, which free people from typing in pages of listings. Instead, programs are read in by a pen-like Bar Code Reader (BCR) in less than a tenth of the time – and they will run first-time as each line is checked by special software as it is entered.

Mike Bostock, the MEP's technology manager, said interest in the project was huge, and that material previously published by the MEP would be used to start off the idea.

The programs, would probably be topic-related, he said, and added: 'We hope to get one (Bar Code Reader) in each of the regional centres and to get bar code programs in the regional newsletters.'



December's booklet

Schemes to use the bar code technology for practical tasks in the educational sphere are being funded by the MEP. These include a library management system (for which more expensive bar code hardware is already used) and marking multiple choice exam question papers.

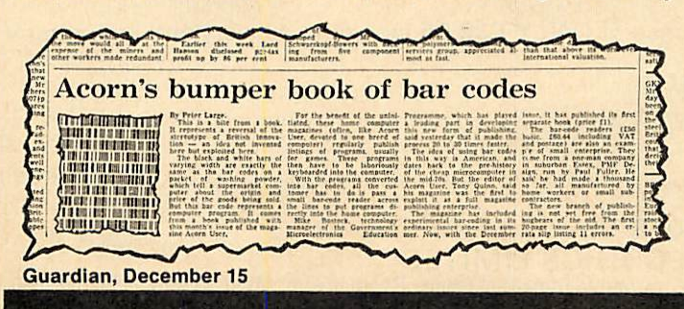
Orders flooding in

Orders for the BCRs, which are being distributed to the public by *Acorn User* (page 115) have flooded in with almost 100 coming from subscribers before the December issue was even on sale in the shops.

An indication of how popular the BCRs are came when the ambassador of one of the African nations dropped his cheque into the *Acorn User* offices personally!

The special booklets of bar code programs containing all the programs from the December and January issues are still available (see page 109 for details).

Mike Bostock said the next stage now the idea was becoming established was to set up user groups around the country to spread the idea and exchange software. Readers interested in joining clubs or starting one should write to *Acorn User* at 68 Long Acre, London WC2E 9JH, and mark the envelope 'Bar Code Groups'.



Acorn's bumper book of bar codes

By Peter Large.

This is a bite from a book. It represents a reversal of the stereotype of British innovation — an idea not invented here but exploited here.

The black and white bars of varying width are exactly the same as the bar codes on a packet of washing powder, which tell a supermarket computer about the origin and price of the goods being sold. But this bar code represents a computer program. It comes from a book published with this month's issue of the magazine Acorn User.

For the benefit of the uninitiated, these home computer magazines (often, like Acorn User, devoted to one breed of computer) regularly publish listings of programs, usually for games. These programs then have to be laboriously keyboarded into the computer.

With the programs converted into bar codes, all the customer has to do is pass a small bar-code reader across the lines to put programs directly into the home computer.

Mike Bostock, technology manager of the Government's Microelectronics Education Programme, which has played a leading part in developing this new form of publishing, said yesterday that it made the process 20 to 30 times faster.

The idea of using bar codes in this way is American, and dates back to the pre-history of the cheap microcomputer in the mid-70s. But the editor of Acorn User, Tony Quinn, said his magazine was the first to exploit it as a full magazine publishing enterprise.

The magazine has included experimental bar-coding in its ordinary issues since last summer. Now, with the December issue, it has published its first separate book (price £1).

The bar-code readers (£50 basic, £60.44 including VAT and postage) are also an example of small enterprise. They come from a one-man company in suburban Essex, PMF Design, run by Paul Fuller. He said he had made a thousand so far, all manufactured by home workers or small subcontractors.

The new branch of publishing is not yet free from the bugbears of the old. The first 20-page issue includes an errata slip listing 11 errors.

Guardian, December 15

Clwyd Technics

TREKKER MK VI ROBOT VEHICLE

Trekker is a multi-function classroom robot vehicle which does much more than merely moving and drawing. Designed for education but also ideal for the home enthusiast, ***Trekker*** is supplied with over 30 pieces of software. Its applications include:

* white line follower * bar graphs
* pen software * angles * polygons
* area measurement * length measurement
* co-ordinates * music * sound

- all of which are graphic, colourful and interesting. The complete ***Trekker*** package includes software guide, user guide, function key overlays and everything you need to teach control technology. The pupil worksheets, OHP transparencies and project work suggestions make ***Trekker*** easy to teach and great fun to learn.

Trekker requires no technical knowledge. An absolute beginner, following the instant start guide, can use his ***Trekker*** robot vehicle within 2½ minutes straight from the pack.

No assembly necessary. ***Trekker*** plugs directly into your BBC microcomputer user port with a single cable (*supplied*) and does not require any other cables, power units or connections.

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DIY command system boosts Wordwise chip

by Jacquetta Megarry

WORDWISE Plus, a powerful development of Computer Concepts' wordprocessing chip, was released last month. The main innovation is the 'segment' concept: by partitioning the Beeb's memory, users can process up to 11 different documents simultaneously. The chip has its own programming language; by storing instructions rather than text in a segment, powerful extra features can be added.

Computer Concepts supply programs to do alphabetical sorting, indexing, mail merge, multi-column work and continuous processing as part of the package. The program for multiple copies is just five lines:

```
SELECT TEXT
DOTHIS
PRINT TEXT
TIMES 6
DISPLAY
```

Storing this in a segment allows you to produce multiple copies at will, and users of the old Wordwise will find the simplicity of this in sharp contrast to the *MULTI machine code routine.

Once readers get hold of Wordwise Plus, let's hope for a free exchange of Wordwise Plus programs in future *Acorn User* columns.

To set the ball rolling, here is a program that will delete one word in ten of whatever text is in memory. This Cloze procedure (as teachers call it) gives full control over both the deletion frequency and the text to be used:

```
REPEAT
DOTHIS

FIND " "
CURSOR RIGHT
TIMES 10
DELETE WORD

TYPE " @"
UNTIL EOT
DISPLAY
```

This searches for every tenth word, which it locates by FINDing a space, deletes it and replaces the word by '@'. TIMES 5 would instead select every fifth word, and so on.

Other procedures can provide running analysis of average word length, sentence length and measures of readability using statistics – powerful tools for analysing text.

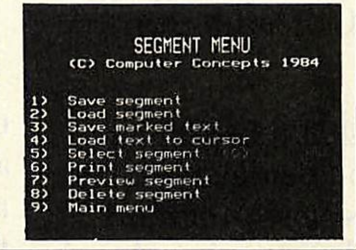
For users who don't want to customise their wp, care has been taken to make Wordwise Plus fully compatible with Wordwise. Beginners need never see the segment menu unless they choose to. The main menu even looks the same; only the extra segment option and a colour keystrip give the new product array.

Apart from segments, other improvements in Wordwise Plus include:

- Disc loading and saving at least ten times faster.
- Safety nets prevent accidental overwriting of an existing file or loading new text without first saving text in memory.
- Two-letter embedded commands give easier access to printer effects.
- More detail shown in preview, including printer effects and page-breaks.
- Additional embedded commands, eg pause for daisy-wheel change, fully indent, * for * commands within text, Ins to show line numbers at preview etc.
- 6502 second processor users will be able to obtain a disc version which complements the ROM and makes all the extra memory available.

A rewritten 200-page reference manual is supplied with a revised touch typing tutor on cassette which includes sample procedures.

Wordwise Plus costs £56.35. Wordwise upgrades are available from Computer Concepts only, by returning the *complete* Wordwise package (keystrip and all), at £19.95.



Buffer board at Watford – plus slapped wrists

WATFORD Electronics' 32k RAM expansion board gives your Beeb 27k of program space plus 20k for graphics, for a cost of £79.35.

As well as the extra program space, there's 12k of memory which can be used as a buffer – invaluable when wordprocessing because while one document is being printed you can be typing in another.

The firm claims compatibility with a 'vast' range of software, including Basic, View and Wordwise. Also from Watford is a £18.40 ZIF socket which allows ROMs to be inserted with the minimum of effort. It plugs into the 'ashtray' on the left-hand side of the Beeb's keyboard.

Slapped wrists all round – the Advertising Standards Authority has upheld a complaint against Watford concerning prices. Whereas a Watford advert was offering a monitor and disc drive for £249 each, when someone tried to buy them the monitor had gone up to £398 and the disc drive to £349.

Watford stated it was due to an error in preparing the advert. Watford prices can be checked on (0923) 40588 – except that the phone's always engaged!

Esher graphics from software

PUBLISHERS Addison-Wesley enter the world of computer graphics with two pieces of software and a book – all for the Beeb and Electron. The book, 'The Art of Microcomputer Graphics', is written by Jim McGregor and Alan Watt, whose work on computer graphics and music will be familiar to *AU* readers from issues dating back to the Spring of 1983.

It sells for £14.95 and covers the theory and practice of computer graphics complete with program listings and actual screen shots.

'Tesselator' is a graphic arts program that fits together user-designed shapes to create a pattern, a technique made famous by the Dutch artist M. C. Esher. It costs a hefty £27.97 on disc or £21.95 on tape.

The other program, 'Graphito', has a library of 40 motifs and six alphabets which can be manipulated on the screen. It costs £29.95 on disc or £22.95 on tape.

Cambridge Micro Software, in conjunction with the MEP, has produced a similar program called 'Tesselations'. The computer automatically provides the symmetry to the shapes which the user draws, and a full colour pallette allows fascinating patterns to be built up.

Available for the Beeb and only on disc, the program costs £21 plus VAT.



Tesselating lizards made famous by Esher

Now, the BBC

The BBC Micro has now taken a giant step into the world of business computing.

With the addition of its new Z80 second processor, it is the first computer at anywhere near its price to become fully compatible with CP/M software.

As most business computer users can verify, CP/M is the most widely used form of software in business today.

For £399, you're well and truly in business.

At £399, the Z80 adds 64K of usable RAM to the BBC Micro. And it allows you to use the CP/M 2.2 computer operating system.

It's extremely fast.

And besides giving you access to a vast new area of software, it enables you to use GSX graphics–based programs, the perfect complement to the BBC Micro's own superb graphics.

Free software and languages.

The Z80 second processor comes complete with five CP/M business programs.

To handle your word processing, there's MemoPlan. It's a program with some highly sophisticated features, such as a safeguard against data loss through power cuts and the ability to show two documents simultaneously on the screen.

To form your CP/M personal database, there's FilePlan. It stores names, addresses, telephone numbers, stock listings and more. And if you use it with MemoPlan, you can generate personalised letters, labels and mail shots.

To produce forecasts and analyse groups of figures diagramatically, simply use the GraphPlan program. This is incredibly helpful in working out vital business calculations, converting them into graphs and charts.

Meanwhile, in the book-keeping department, there's the Accountant program. Use it to enter day-to-day transactions into the computer. Then, at any time, you can ask the computer to produce lists, summaries, reports, audit trails and trial balances. You can readily expand this package to a fully ledger based system, complete with payroll and more.

Finally, to help you to develop your own programs without having specialised experience, the Z80 comes with another software package called Nucleus. It's a system generator which asks you questions and uses your answers to enable the system to write the program.

You can use Nucleus directly with the Accountant program, or for specialised personal or business activities.

Additionally, the Z80 package enables you to use three programming languages.

Your BBC Micro instantly becomes multi-lingual.

To simplify writing your own software with the Z80, there's BBC BASIC.

For running professionally written business programs, there's Professional BASIC.

And then there's CIS COBOL, the leading microcomputer version of COBOL, the language used in mainframe computer applications throughout commerce and industry.

With CIS COBOL, the Z80 also gives you two sophisticated programming aids.

CP/M is a registered trademark of Digital Research Inc.



Z80 second processor with CP/M business package. £399.

One is Animator, an award winning debugging tool which enables you to identify programming errors quickly and easily.

The other is FORMS 2, which helps you to write your own interactive programs in COBOL.

With all these sophisticated features, the Z80 package is exceptional value for money. Indeed, bought separately the programs and languages could cost as much as £3,000.

See the Z80 at work.

The Z80 second processor is designed to be used with the BBC Micro Model B incorporating a Series 1.2 Machine Operating System and linked to a dual 80-track disc drive, a printer and monitor.

Ask your BBC Micro dealer to show you just how far it can go in the world of serious business computing.

For your nearest dealer, ring 0933 79300.

Technical specification.

The Z80 has a 64K Random Access Memory, running CP/M 2.2 which provides approximately 55K bytes of RAM for user programs. It operates at a clock rate of 6MHz. Power supply is integral. Height, 70mm. Width, 210mm. Depth, 350mm.

The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.



YOUR HOME
COMPUTER

IS AS EASY

AS READING
THIS.

Let's face it, most 'beginner's guides' are anything but easy reading.

Now Dorling Kindersley have come up with a new way of learning BASIC that's unique, simple and down-to-earth.

It's called 'Screen Shot.'

Unlike ordinary guides, Screen Shot uses full-colour photographs of real computer screens to show instructions, program listings and displays.

So what you see on the screen in the book is precisely what you'll see on your own computer screen.

Which makes our programs easy to understand, easy to read and free from misprints or other sources of confusion.

The accompanying explanations are clear, practical and are written by experts.

You'll find there are Screen Shots for most popular makes of home micro.



Books 1 and 2 of each series form a complete guide to BASIC programming for that computer.

For the more adventurous programmer, Books 3 and 4 explore the creative world of computer graphics.

In the words of a reviewer in 'Big K' magazine, Screen Shots are "...clearly and expertly written with the best layout I have seen in a book of this sort...what you see is (for once) what you get. Outstandingly good and for beginners or semi-beginners: highly recommended."

The message is clear. If you really want to get into programming, get a Screen Shot.

With anything else, you won't be fully in the picture.

Screen Shot
PROGRAMMING SERIES

Screen Shot books available from larger branches of BOOTS, MENZIES, WH SMITH and other leading bookshops and computer stores. In case of difficulty, write to: Dorling Kindersley, 1-2 Henrietta Street, London WC2E 8PS.



DK Screen Shot Books 1 and 2 available for Acorn Electron, BBC Micro, Commodore 64, Sinclair ZX Spectrum, Sinclair ZX Spectrum+, Apple IIe. Books 3 and 4 available from April 1985.

Dorling Kindersley Publishers Limited.

Balls and mice bypass the keyboard

GAMES enthusiasts now have an alternative to the joystick in the shape of the Trackball.

The £29.90 device plugs into the Beeb's joystick port and consists of a captive snooker ball which is rotated using the fingertips.

As well as games, Trackball can be used for graphics and cursor control.

The manufacturer, Wigmore House, claims it is faster and more precise than a joystick, yet it will work with most joystick-compatible software.

Two graphics packages are available: *Trackpaint*, at £9.50; and *Cadtrack*, with more sophisticated design software which uses icons, for £19.90 on disc. Wigmore House can be contacted on 01-734 0171.

Marconi has released a similar product for the BBC, imaginatively titled the RBP2/PC, which sells for £59.50. It's based on the tracker ball controllers that Marconi makes for air traffic control systems and comes with utilities software. Marconi is on (0522) 29992.

Mouse

The BBC micro gets its own icons and on-screen windows – as used in business micros such as Apple's Macintosh and Acorn's ABC300 – thanks to the AMX Mouse from Advanced Memory Systems and some sophisticated software.

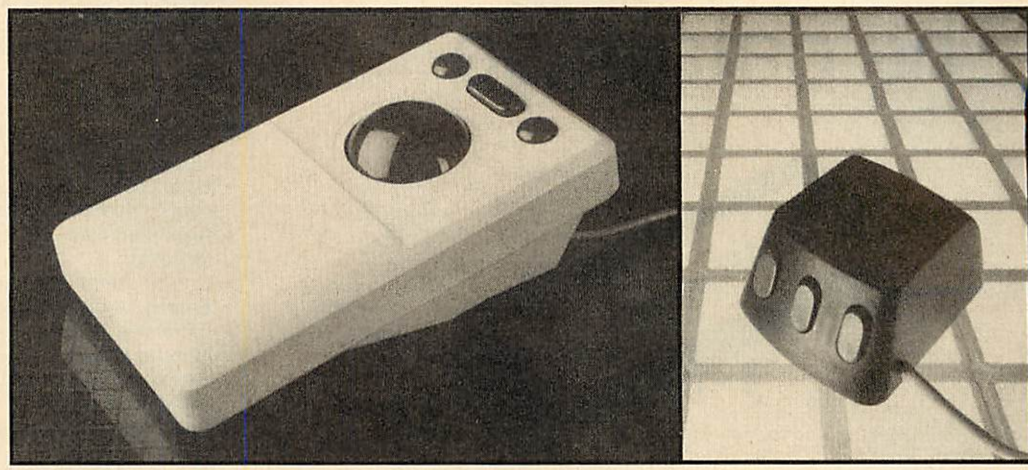
The £89.95 Mouse was unveiled at last year's *Acorn User* Show but the all-important software has only now become available.

By moving the mouse around the table-top, a screen pointer can be positioned over various icon symbols, providing a user-friendly method of opening files etc. Sixty-four icons are stored in the ROM which also contains the operating software.

The Mouse can also be used as for graphics and the software includes routines to draw, spray, fill and write in different text styles.

Wordwise or *View* owners can use the Mouse to move blocks of text etc.

The AMX Mouse is available from Advanced Memory Systems, on (0925) 62907.



Trackball is one of two similar products, but AMX Mouse claims a first

Thumbs up to Beebs and mail from the deaf

by Geoff Nairn

TELECOM Gold, British Telecom's electronic mail service, has been pronounced a major success in helping deaf people around the country communicate.

Half the people who took part in the Visicom project have kept their Telecom Gold mailboxes – and many are using BBC micros as terminals linked through modems.

Visicom was set up to evaluate ways for deaf people to communicate using the telephone and, as well as Telecom Gold, Prestel and the bulletin board services were included in the trial, which involved more than 60 deaf people.

Telecom Gold came out on top, due mainly to its interactive 'Chat' facility which allows deaf people to hold a conversation – albeit typed – for the first time.

Said Anthony Burton-Brown, who headed the project: 'Some of them use 'Chat' a lot and clock up literally hours of use; there's no other way for them to communicate.'

The project was sponsored by the Department of Trade and Industry to the tune of £72,000.

Although it is now finished, 60 per cent of the deaf people who took part have kept their Telecom Gold mail boxes and are now paying the charges themselves.

Similarly, when the BT-provided terminals were taken away, 10 people went out and bought BBC micros to replace them.

●PIRATES and other seafaring micro users can now send messages to their pals at home thanks to a new satellite link.

Ships equipped with a satellite terminal (and Acorn is developing one) can link their BBC micro to British Telecom's Goonhilly earth station in Cornwall and thence to Telecom Gold.

Index and 'Chat' facilities are included, although chatting via an INMARSAT satellite will no doubt cost more than a few bob.

GP software – and battery power

DOCTORS in surgeries and hospitals are flocking to use BBC micros, and the Micromedic suite of five programs for GPs in the latest medical software.

Micromedic is for use by surgery staff, and its authors claim to have tested it on a group of doctors with 13,000 patients.

The software will create five registers for age/sex, repeat prescriptions, cytology, immunisation and disease. It warns receptionists when patients are due for tests or check-ups and helps set up attendance timetables.

There are 25,000 GPs in Britain, and the BBC micro is at present being evaluated by the Department of Health for use in surgeries.

For details of Micromedic, contact The Computer Room in Nottingham on (0773) 718578.

●TWO battery back-up units which will keep a BBC micro system running for up to six hours has been produced for hospitals or schools.

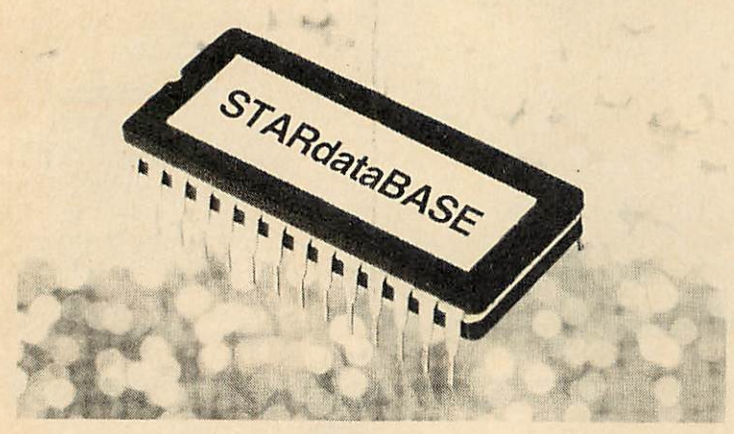
John Richardson Computers, which markets BBC and Electron-based labelling systems for chemists, sells the units.

They are priced from £175 (+ VAT) and can be linked to several car batteries.

The larger version carries its own battery to give about 10 minutes of power. The company can be contacted by doctors, teachers and campers in Preston on (0772) 323763.

STARdataBASE . . .

The database



for the BBC

STARdataBASE is the fast, machine-code, true random access, database program in 16K ROM for the BBC Microcomputer, complete with over 75K of FREE extension Software.

FEATURES:

* Up to 4096 records in a file.
* Up to 69 fields in a record.
* Up to 255 characters in a field (subject to an overall maximum of 920 characters in a record).
* An entirely User-defined record layout, including a facility for colour.
* Can be used with 40 and 80 track Disk Drives.
* Entirely Menu-driven, extremely User-friendly.
* Extremely fast search – A single record can typically be found in 1 second using the Keysearch facility.
* Search conditions include the following: =, <>, <, >, and "Anywhere in the field".
* Powerful facilities to edit records.
* Mail-merging between documents created on Wordwise or View, and STARdataBASE records.
* Print-out of the whole database or selected Subsets, in the form of Record cards.
* Address label printing – (up to 8 across the page).
* Fully documented routines which can be included in user-written programs and interfaced with STARdataBASE.

STARdataBASE .... £86.25 inc VAT
Post & Packing .... £1.75 inc VAT



GCC (Cambridge) Limited
66 High Street, Sawston, Cambridge CB2 4BG
Telephone: Cambridge (0223) 835330/834641
Telex: 81594 SAWCOM




Trade and local authority enquiries welcome.
Prices correct at time of going to press.

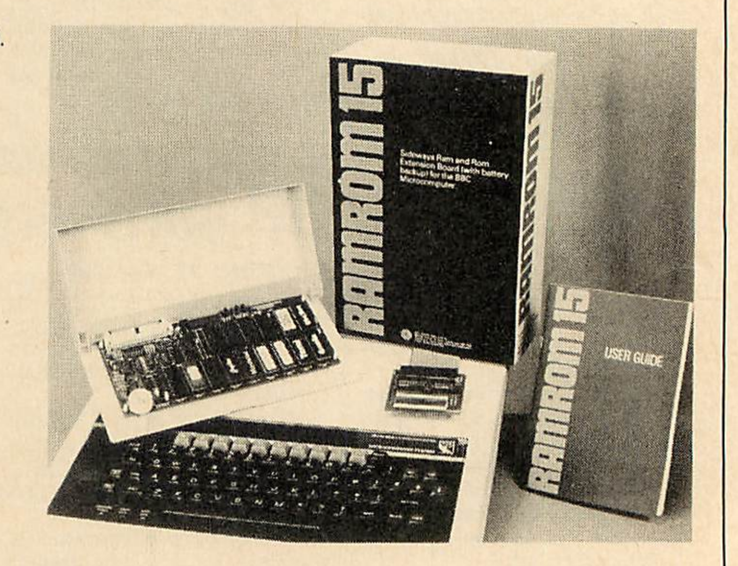
RAMROM 15

The Sideways RAM & ROM Expansion Board for the BBC

The GCC RAMROM 15 board adds to the BBC Micro another eleven sideways ROM sockets plus the necessary hardware for sideways RAM.

FEATURES

* Fully buffered board.
* Rechargeable battery backup for RAMS provided as standard. Recharging circuitry is included.
* The board can be powered by an external 5 Volt power supply, available as an optional extra.
* The unit comes in a case of its own and resides outside the BBC Micro, giving easy access to the resident ROMS.
* For those involved in development work, most of the 6502 processor signals are made available outside the BBC Micro.
* Priority or selection can be assigned to either RAMS or ROMS.
* ROMS can be used in RAM positions simply by changing two push-on links.
* Simple installation – NO soldering.
* Can be installed together with most other BBC add-on boards.
* ZIF-sockets available as optional extras. Up to 15 may be housed on the RAMROM 15 at any one time.
* All socket positions are software selectable.
* Free Utilities Disk supplied.
* Comprehensive User Manual included.



RAMROM 15 .... £129.95 inc VAT (P&P £3.50 inc VAT)
EXTERNAL PSU .... £5.75 inc VAT (P&P £1.73 inc VAT
ZIFSOCKETS .... £9.00 inc VAT Free P&P with RAMROM)




Trade and local authority enquiries welcome.
Prices correct at time of going to press.



GCC (Cambridge) Limited
66 High Street, Sawston, Cambridge CB2 4BG
Telephone: Cambridge (0223) 835330/834641
Telex: 81594 SAWCOM

Video tapes to master Z80

MASTER Class is a range of video tapes aimed at those trying to master their Beeb or Electron.

Subjects covered are: elementary Basic, further Basic, graphics and games, the Beeb in education, and an introduction to Z80 business software.

Each tape contains computer programs which can be transferred to a cassette recorder and loaded into the computer. They cost £19.95 each in VHS or Betamax format. Details on 061-437 0538/9.

Chip rubber

UVIPAC is an EPROM eraser for the home micro enthusiast. The unit can erase up to three chips in 15 minutes, and has a beeper to tell you when the time's up.

Uvipac costs £28.45, or a more basic version costs £21.45. Details from Ground Control on (0702) 230324.

Elite – the blockbuster

AFTER just three months *Elite* has proved to be Acornsoft's most successful title to date.

By mid-December the space adventure game, written by two university undergraduates David Bell and Ian Braben was number one in the *AU* charts and number three in the all-model *Microscope* charts. Combined sales exceeded 85,000 for Beeb and Electron versions.

An Acornsoft spokesman said: 'While other companies talk about mega-games, we've actually produced one. *Elite* has put Acornsoft back on the map.'

AU has already received many letters from readers who have attained 'Elite' status and who are claiming the highest credit score. Acornsoft, however, say the game is not won by the highest number of credits alone; the code number is more important as its shows just how well you've played the game and, we're told, even records the number of times you've been hit by the enemy.



Elite: book of the game

On a similar note, it has come to our attention that Elite characters are displayed on dial-up bulletin boards for people to download who already have the game. Also, Watford Electronics' disc filing system grants you Elite status straight away!

Acornsoft has assured us that anyone who 'cheats' by exploiting any of the bugs in the game to gain credits or Elite status will not be able to win the monthly competitions.

All eyes are now turned on Acornsoft to see what the follow-up to *Elite* will be.

But the spokesman was not forthcoming: 'The next flagship product that comes along will have its own target sales figure.

Inevitably people will compare it with *Elite*, but it could well be a totally different type of game.'

And he certainly would not be drawn as to exactly what type of game that might be.

Elite still at No. 1 – Software Chart page 165.



Peter Barkworth is the computer millionaire whose wife is kidnapped by terrorists.

BBC micro role in TV talent show

FAME Game is a hi-tech version of that seminal TV talent show, *Opportunity Knocks*; only this time the voting is done electronically from homes up and down the country.

A BBC micro turns the votes into graphic form to be superimposed on the TV pictures. The Granada TV show will go out live on Saturday evenings at 6.30 starting January 19.

Each week, hopeful acts will compete in various categories – singers, comics and speciality acts – for the chance to come back the following week.

A thousand selected households are each equipped with small viewdata terminals, linked via the phone lines to a minicomputer which adds up the votes.

The voting information is sent to a BBC micro in the TV studio which displays the total votes as bar charts on the TV screens of viewers across the nation.

In case anything goes wrong, the studio audience votes can be polled instead and fed into the Beeb. A pilot show was broadcast last year with no problems and the system, developed by AGB Cable and Television, was also used during the 1983 General Election.

On television

Channel 4's psychological thriller, *The Price*, is about a computer millionaire whose wife and child are kidnapped. The writer was responsible for the award-winning *Minor Complications* play and with Peter Barkworth in the lead role it sounds worth watching. Thursdays, 9pm.

Also on C4, *Me & My Micro* is being repeated on Mondays at 5.30pm, until February 4. The series aims to teach Basic programming and was first shown on ITV last year.

Starting on February 11, *4 Computer Buffs* will take over the *Me & My Micro* slot. As you might gather, it's for serious micro users and promises to be particularly strong on computer communications.

BBC TV's *Micro Live* takes to the road with a live broadcast from the British Telecom Research Laboratories. It will show how BT uses video discs and computers to map the positions of its telephone cables, and the latest developments in optical fibres. The BBC micro will be put through its paces creating graphics. BBC2, February 8 at 6.00pm (repeated next day at lunchtime).

BBC2 will be repeating *Making the Most of the Micro* (Fridays, 12.05pm) and *The Electronic Office* (Sunday mornings).

Barry in peril?



THE final programme of the second series of Radio 4's *Chip Shop* went out live from the Barbican on December 15. As we went to press, there was no confirmation of another series. Will Barry Norman be cut off in his prime? Is this the end of all those bad jokes? Find out next month. (But we hope not!)

To contact

☐Acorn Customer Services (0223) 210111

☐Radio 4 *Chip Shop*'s Chipline:

London 01-790 3400
Liverpool 051-236 8474
Birmingham 021-355 6144
Bristol (0272) 279494

☐BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

☐BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send stamped-addressed envelope.

☐MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne, NE7 7XA. Hardware and software support for schools. Please send sae.

☐MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send sae.

☐MUSE (Micro Users in Schools and Education), Freepost, Bromsgrove, Worcs B62 7BR. User group for teachers and parents. Please send sae.

☐National Extension College, 18 Brooklands Ave, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

☐CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Government body which oversees MEP. Please send sae.

☐Software Limited configure CP/M programs for the BBC micro. Write for a catalogue to No 2 Alice Owen Technology Centre, 251 Goswell Rd, London EC1N 7JQ. Tel: 01-833 1173.

For help

☐To contact *Acorn User* authors, write c/o the editorial address given on page 2 of this issue.

☐Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

☐Monitor choice: Photocopies of the review of four monitors, plus a set of nine test programs from the June issue cost 72p (inc post). A copy of the issue costs £1.25 (see page 93).

☐Bulletin boards: Information on 26 free-access boards was given in the October issue. 54p for photocopy (see page 93).

☐For *Acorn User* cassettes, discs, back issues, binders, contact PHS Mailings on (02934) 72208 (see page 96).

On Prestel

TUBELINK is a database for users of second processors on Viewfax, which is part of Prestel Microcomputing.

Pages start at ★258216# and are aimed at programmers with 6502 and Z80 add-ons (Torch and Acorn).

On show

☐January 15-18, Which Computer? Show, National Exhibition Centre, Birmingham. Contact: Hugh Keeble, 01-891 5051

☐January 23-26, Hi-Technology and Computers in Education, Barbican Centre, London. Contact Tim Collins, 01-930 1612. Free to teachers/educational officers, etc. Public admittance on Saturday 26 only.

☐February 19-21, Computer Graphics User '85, Barbican Centre, London. Contact James Lonsdale, 01-486 1951.

For disc

☐Tape to disc transfer utility: June 84, p55.

☐Copy 40-track discs to 80-track discs, August 83, p39. NB line 610 is missing and should read: 610 =X%?T%

☐40/80 dual format discs: produce discs readable on both types of drives, Feb 84, p69.

Blunderbox

☐AMBIT International who produced the satellite receiver kit detailed in 'Downloading the Weather' from the August 1984 issue have become part of Cirkit Holdings who can be contacted on (0992) 464455. The kit will be available from Cirkit at the beginning of February.

☐IN DECEMBER'S Hints & Tips we said that a Wordwise listing of the Epson FX80 control codes would be included on that month's cassette. It wasn't, but will be on the February cassette. Many apologies.

Choosing a printer is a lot easier than choosing a computer.

THERE are dozens of quality printers from which to choose. With quality price tags of around £250.

The Brother M-1009, however, breaks all the rules.

Stays defiantly below the £200 barrier.

Though it has far more than its fair share of features, it maintains the extraordinarily low price of £199.95.

Travels at a steady fifty.

In the speed stakes, the M-1009 is certainly no slouch, being fully capable of up to 50 characters per second.

Providing bi-directional and logic seeking printing for normal characters and uni-directional printing for super and sub script and graphics.

Prints on any paper.

Being an impact printer, the M-1009 will print on virtually any paper, including letter headings, invoices and standard office stationery.

It will even print two copies together with your original.

A superb character recommendation.

In its price range, the M-1009 has a great deal more character than many printers.

96 no less, plus international type and graphic characters.

Reliability comes as standard.

Built to the same exacting standards as Brother's elite office printers, the Brother M-1009 already has faultless credentials for reliability.

Its 9 pin dot matrix head, for example, has an astonishing 20 million character service life.

One printer that doesn't block out the light.

Many home computers tend to be a little on the large side.

In contrast, the compact M-1009, at only 7 cm high, keeps a discreet profile.

Well designed, reliable – and conscientious.

The Brother M-1009.



The future at your fingertips.

DEPT P, BROTHER OFFICE EQUIPMENT DIVISION, JONES + BROTHER, SHEPLEY STREET, GUIDE BRIDGE, AUDENSHAW, MANCHESTER M34 5JD.
TEL: 061-330 6531 (10 LINES) 061-330 0111 (6 LINES) 061-330 3036 (4 LINES) TELEX: 669092
BROTHER INDUSTRIES LIMITED, NAGOYA, JAPAN.

AVAILABLE FROM

BOOTS, WILDINGS, SPECTRUM, JOHN MENZIES, MICRO MANAGEMENT, MAJOR DEPARTMENT STORES AND ALL GOOD COMPUTER SHOPS.

University Software

UNISTAT

STATISTICAL PACKAGE

MULTIVARIATE REGRESSION: Main output consists of estimated coefficients, t-stats, standard errors, R^2, corrected R^2, standard error of regression, F stat, and Durbin-Watson stat. Further output options: multiple correlation matrix, var-covar matrix, ANOVA of regression, residuals, plot of residuals, interpolation. Data options: Log/ln option for each variable, no-constant regression, choice of dependent variable, selection of independent variables, auto-omission of linearly dependent variables.

ANALYSIS OF VARIANCE, SCATTER DIAGRAMS AND TIME SERIES PLOTS: One-way and two-way (without interaction) ANOVA tables, scatter diagrams of paired data and time series plots with auto-scaling.

STATISTICAL TESTS, CORRELATION COEFFICIENTS AND PROBABILITY DISTRIBUTIONS: Basic stats on each column of data (size, sum, mean, variance, std. dev.). Chi-square (contingency table), t (one sample, two sample, paired), F, Mann-Whitney U, and Wilcoxon signed rank tests. Pearson's, Spearman's rank and Kendall's rank corr. coefs. Chi-square, t, F, binomial, Poisson and normal (std., non-std.) distributions. Results of tests and corr. coefs are displayed with significance levels.

DESCRIPTIVE STATISTICS, FREQUENCY DISTRIBUTIONS AND HISTOGRAMS: Analysis of raw data or data with frequency counts. Raw data sorted and grouped. Choice of lower bounds and class intervals. Absolute, cumulative and relative frequencies. Histograms with up to 200 classes. Output displays sum, mean, mean deviation, median, variance, std. dev., 3rd and 4th moments, skewness, kurtosis, range, etc.

All programs are datafile compatible with Matrix Operations program in UNIMAX package. Data matrix capacity examples (columns by rows): **CBM-64;** 2x1250, 5x700, 10x380, **BBC-B;** 2x750, 5x400, 10x200, **48K Spectrum;** 2x1800, 5x900, 10x500. **CBM-64** (disk): **£85, BBC-B** (disk): **£85, 48K Spectrum** (mdvcart/cass): **£60**

UNIMAX

LINEAR PROGRAMMING PACKAGE

LINEAR PROGRAMMING: A powerful and instructive optimisation program capable of handling all sorts of linear programming problems (min/max, any combination of <=, =, >= constraints and $x_i >= 0$, $x_i <= 0$, $-\alpha < x_i < \alpha$ sign constraints). Primal, canonical, dual and their solutions are displayed in standard mathematical form. Unbounded problem and no feasible solution prompts. Edit option for all inputs. Capacity examples (variables by constraints): **CBM-64;** 10x35, 25x30, 40x25, **BBC-B;** 10x25, 20x20, **48K Spectrum;** 10x45, 25x35, 50x25.

MATRIX OPERATIONS: Inversion, transposition, determinant, pre- and post-multiplication, scalar multiplication, addition and subtraction of matrices and vectors. Any output can in turn be used as the input of the next operation without re-typing. Matrices can be saved or loaded at any stage. Datafile compatible with **UNISTAT** package. Capacities: **CBM-64;** 35x35, **BBC-B;** 25x25, **48K Spectrum;** 45x45.

CBM-64 (disk): **£60, BBC-B** (disk): **£60, 48K Spectrum** (mdvcart/cass): **£45**

ALSO AVAILABLE FOR 48K SPECTRUM
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TEL: 01-359 0978

Prices include VAT and delivery within the UK. For orders from Europe add £1.50, outside Europe £3.00 per item for airmail post. Dealers enquiries welcome.

COMPATIBLE WITH sinclair ZX Microdrives

COMMODORE 64, BBC-B, 48K SPECTRUM
✻ Comprehensive user manual ✻ Full data handling facilities (display, print, change, save, load)
✻ All results can be printed out ✻



PENMAN

ALL MY OWN WORK
Penman

ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@{|}~!"#$%&

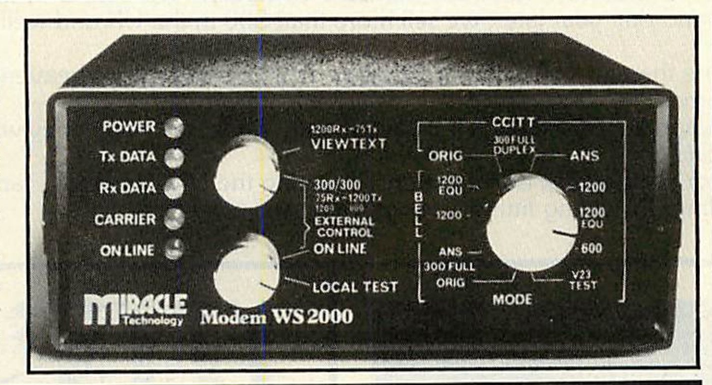
Suddenly, quality plotting is within reach of every computer user...

It's a miracle! WS2000 approved

MIRACLE Technology's WS2000 modem has received BABT (British Approvals Board for Telecommunications) approval.

This means that modem can now be used with the telephone system legally.

The modem costs under £162.85 inclusive.



BBC network with RML

MEADNET is a low-cost networking system which allows up to 16 BBC micros to share disc drives and printer using an RML 380Z computer.

Software can be transferred onto Meadnet from a cassette player or disc drive and stored on the 380Z's disc drives. The network costs £275, plus £20 for each station, and is claimed to be compatible with BBC Basic, View, Wordwise and Edword. Details on (0734) 665771.

Beeb sound board

POWERTRAN Cybernetics has produced a digital sampling unit, the MCS1, which can be used with a BBC micro. Digital sampling involves recording parts of natural sounds and then using them as the basis for creating some decidedly unnatural sounds.

The MCS1 costs £783.85 and plugs into any keyboard synthesiser which has the standard Midi interface. Although a BBC micro is not necessary to create the sounds, it does allow them to be saved on disc, so creating a whole library of weird and wonderful sounds.

Powertran also supplies the necessary Midi interface for the Beeb at £67.85. Contact (0264) 64455.

Russian on View

LANCHESTER Polytechnic's range of language learning software can cope with special characters – including Russian.

Unitext allows a teacher to create text files in English, French, German or Spanish; Unitest and Unigap are student test programs which use the files. The equivalent Russian programs display Cyrillic characters.

Uniview and Rusview display *View* text files in the same languages. All packages cost £10 on disc, except for Unitext (£30) and Rustext (£40). Add £2 for 80-track discs. All enquiries on (0203) 24166 x222.

Engineer's tool

ACRONYM time again – BCSSP stands for Bristol Continuous System Simulation Program and it's claimed to be an essential tool for studying complex dynamic systems in science and engineering.

The BBC software costs £75, but institutional users pay more (£250), while educational users get away with a mere £150. Call (0590) 73503.

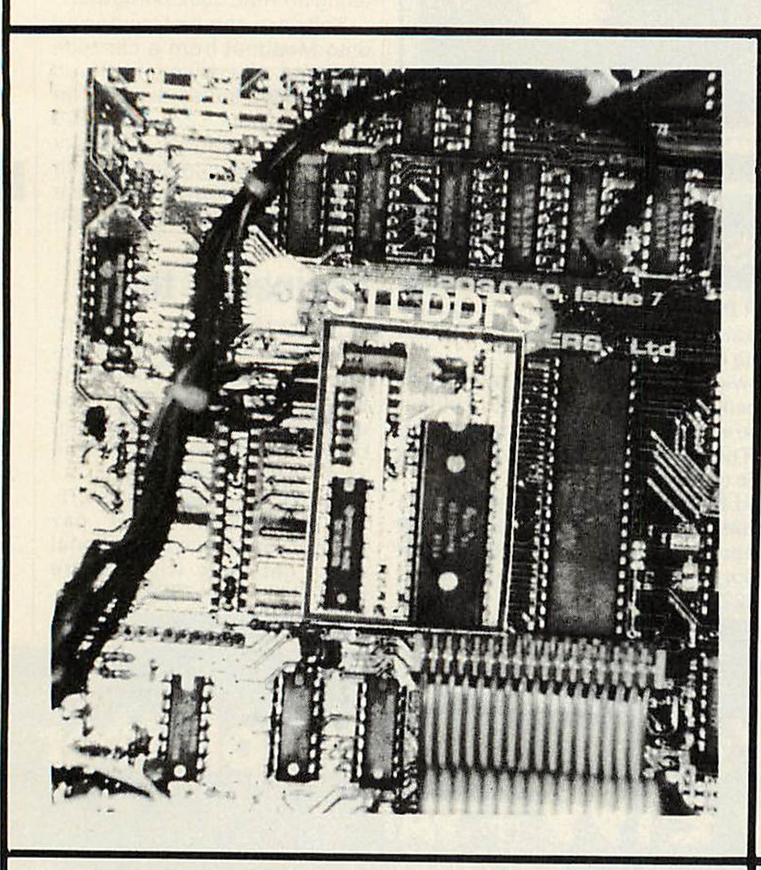
FROM SMALL ACORNS, SOLIDISK GROWS.

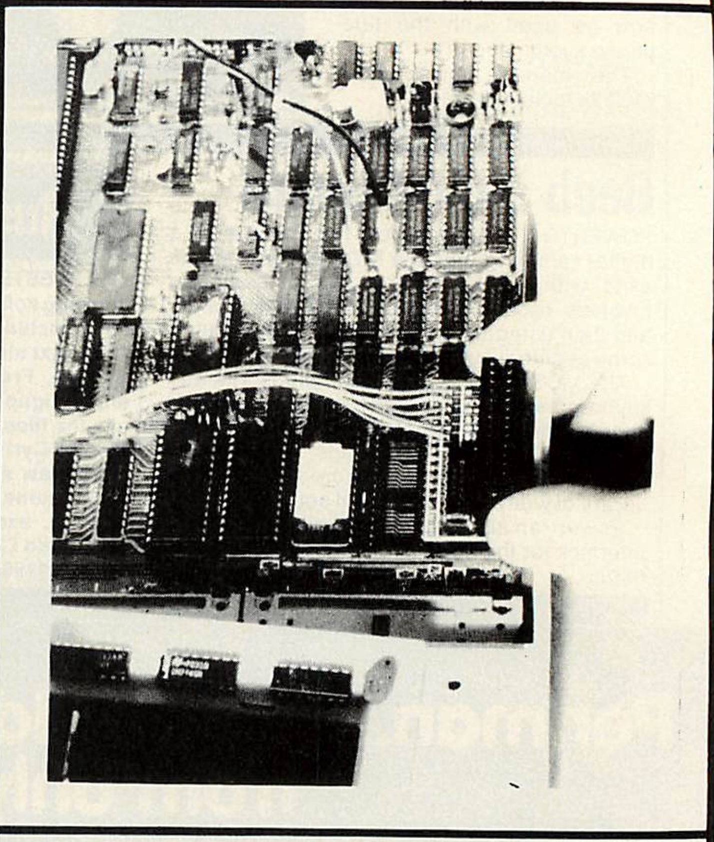
IN JULY 1983, we released the Sideways RAM for the BBC computer. We sold 5 in the first week, 10 in the second week, 20 in the third and one year later, we sell more than 500 in the UK and well more than 100 a week abroad.

By the time you read this, more than 30,000 Solidisk Sideways RAM boards will be beavering away in hundreds of schools and thousands of homes.

They are being joined by thousands of Solidisk DDFS each month. Soon, we hope, they will all be linked together by Solidisk Single Chip MODEM.

To support the users, a network of Solidisk Local Experts, covering the UK, Holland, France, Australia and Israel has been set up and expanding. Providing fitting and software.





SOLIDISK DOUBLE DENSITY DFS 1.5:
Single and Double Density.
Automatic Density Selection.
1 or Twin Drives, 40 and 80 Tracks, Single and Double Sided.
Automatic 40 and 80 Track Selection.
31 Filenames.
Low Cost.

SOLIDISK DOUBLE DENSITY DFS 2.0:
Virtually Unlimited Number of Filenames.
Automatic Tape to Disk.
Built-in Disk Fix and Disk Sector Editor.
Built-in Wordprocessor.
Does not Require DNFS With Z80 and 6502 Second Processors.

SOLIDISK SIDEWAYS RAM:
Add from 16k to 256k bytes of RAM to the BBC 32k RAM.
Useable for running Sideways ROM Software.
Useable in Networks or on BBC with Disk Drive(s).
Compatible With All Acorn Existing Products.
Including Econet, Teletext, 6502 and Z80 Second Processors.
Compatible With Most Sideways ROM Software.
Available Multi User Licencing Agreement from Leading Software Houses.
Easily Expandable as Your Needs Grow.
Low Cost.
Free Installation if Required.
Very large User Base, Extensive Free Software.
Local Help by Solidisk Local Expert Network.
Free Membership to receive Periodic Newsletters.

COMING SOON:
SOLIDISK is at present developing a state of the art MODEM. This will be compatible with the CCITT V23 and BELL 202 transmission standards at speeds from 5 to 1200 Bauds and will be based on the TMS 3105 single chip FSK MODEM manufactured by TEXAS Instruments.
The price is expected to be £39.95 inclusive of VAT.

We need you and your help. To make Solidisk Users the largest BBC Users Group. To share good ideas and good ways to use them.

SOLIDISK TECHNOLOGY, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX
TEL. (0702) 354674 (10 lines).

HAVE YOU ALREADY GOT DISK DRIVE(S) FOR YOUR BBC COMPUTER?

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K-10 FILES	22.42	18.82

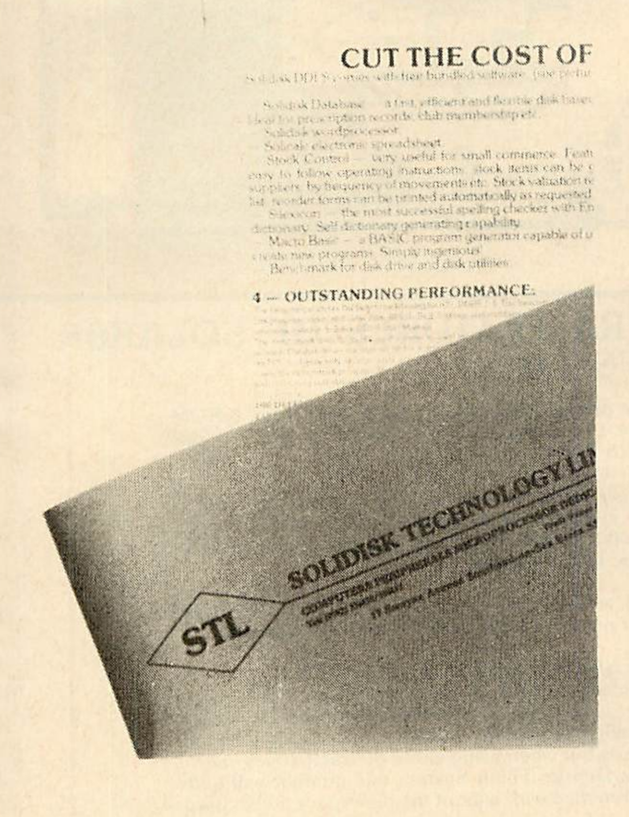
THE SOLIDISK DOUBLE DENSITY DFS

If you take your Disk Systems seriously then there are very few viable alternatives to our new Double Density Filing System.

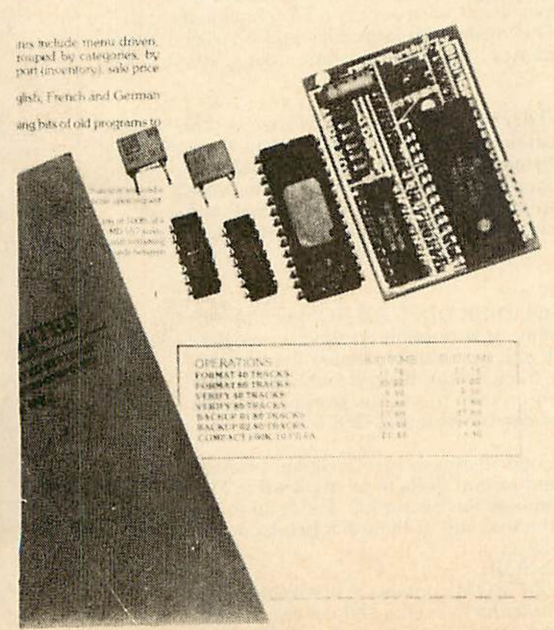
Anyone, with their ear to the ground, will probably have heard of the great shortage of the 8271 Floppy Disk Controller chip. This chip is, of course, the basis of all single density DFS upgrades for the BBC Microcomputer and is used extensively by Acorn, AMCOM and Watford Electronics in their respective DFS's.

This shortage can mean long delays or paying much inflated prices to obtain your Disk Upgrade.

Now, however, we at SOLIDISK have developed an alternative system with many advantages over the 8271 based upgrades. Not the least of these being continuation of supply of the FDC chip (Western Digital 1770) but, also, improvements in the speed and versatility of operation.



RUNNING YOUR MACHINE



EASY TO INSTALL

The SOLIDISK DDFS comes complete with an easy to follow manual with step by step installation instructions, and can be fitted in just a few minutes by anyone with just the barest knowledge of the insides of their BBC.

The DFS contains just 4 IC's and 2 jumpers to be inserted and one link to be cut in the computer. This is compared to the usual upgrades which require 11 IC's to be fitted and the link to be cut.

EASY TO USE

The SOLIDISK DDFS Revision 1.5 contains many time and labour saving features. These include formatter, verifier, automatic density sensing, automatic 40/80 track switching and Single/Double Density mass copying etc.

COMPLETE CONTROL OVER THE DISK

SOLIDISK DDFS gives you complete control over your disk drive(s). You can use any combination of Single/Double Density, 40 or 80 tracks in one or two disk drives.

Every time the SOLIDISK DDFS accesses the disk it detects the density and the disc size in use and acts accordingly.
You can for example copy from a 40 to an 80 track disc on the same 80 track disk drive or even format a 40 track disk in an 80 track drive using the automatic disc size sensing in the DDFS. It is also possible to have one side of a disc formatted in Single Density and the other side in Double Density. Also copying between different densities is coped with automatically and, when using twin drives, is very fast.

GREATER DISC CAPACITY

When formatting a disk with the SOLIDISK DDFS you have a choice of the usual Single Density or the increased capacity Double Density.

Formatting in Single Density will leave your disk compatible with all other Single Density systems. However if the disk is formatted in Double Density it will have a 60% greater capacity than the equivalent size Single Density disk. This means that on an 80 track disk that the capacity is increased from the usual 400 kbytes to 640 kbytes of storage. The Double Density Format used is, at present, unique to the SOLIDISK DDFS and provides 16 sectors per track as opposed to the usual 10 sectors in Single Density giving a 40% saving in media surface for a file of given length over Single Density.

INCREASED SPEED OF OPERATION

As mentioned previously a disk formatted in Double Density uses about 40% less disk space per given length of file than does a disk formatted in Single Density or alternatively it holds 60% more information per track. This allows the, already fast, SOLIDISK DDFS to run very fast in the Double Density mode as demonstrated in the benchmark test on the next page.

BENCHMARK OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.

The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, pre-verified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests, 10 timing samples are taken and the mean time is calculated automatically.
For example:

100 DEFFNb1:REM Save a 16k program.
110T% ÷ TIME
120 *SAVE A 8000 +4000
130 ÷ TIME — T%
Full listings are included in the User Manual.
This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME
B1 Save 16k	2.62	1.43
B2 Load 16k	2.45	1.23
B3 Openin and close 100 times	20.70	20.16
B4 Openout and print 1000 numbers (255)	5.84	4.66
B5 Openin and input 1000 numbers (255)	4.72	4.14
B6 Openout and print 100 80 bytes strings	6.18	4.91
B7 Openin and input 100 80 bytes strings	4.90	4.31
B8 BPUT 100 bytes (255)	3.01	2.06
B9 BGET 1000 bytes (255)	1.88	1.52

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

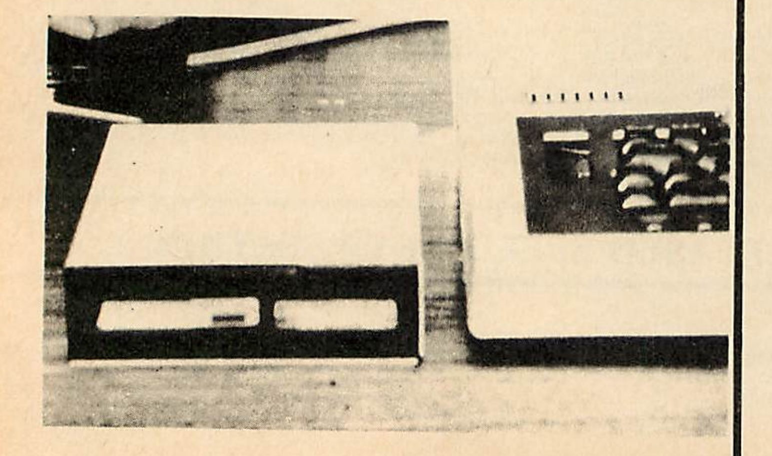
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BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K 10 FILES	22.42	18.82

With Wordwise:
Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC).
With Scribe:
Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC.90 DFS)
With Beebug's Masterfile:
Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken: 56.23 sec. (127.86 sec. with AC.90 DFS).
These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

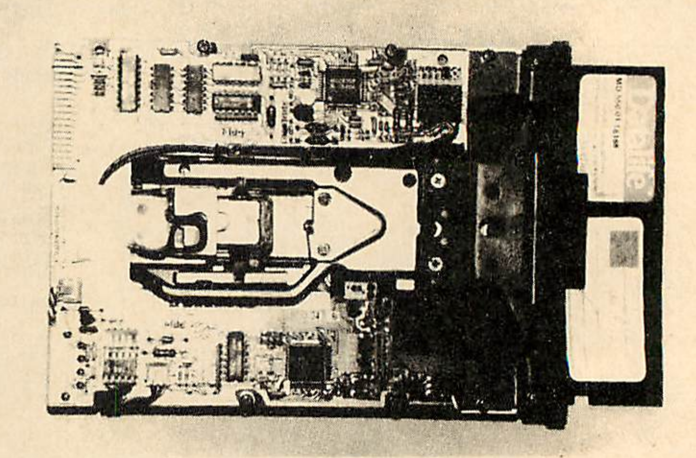
Solidisk engineers won't stop there.



MITSUBISHI DISK DRIVE:
From the new VLSI ultra quiet auto spin-up series comes the MITSUBISHI M4853. We have chosen it for its speed, quiet performance, low power consumption and state of the art design — look at the following features:
— new developments by Motorola and Mitsubishi largely reduce the area taken up by electronics, leaving more room for the diskette. This in turn implies lower noise levels and reduced friction on diskettes.

8 Slim 5.25" half height model attractively cased in BBC micro beige
— Reliability; we find that Mitsubishi compares most favourably with other makes
— Use your BBC own power supply —
— Single and double density available, plus ability ro read 40 track diskettes formatted elsewhere when used with our DFS.

Of course, we don't need to mention that all drives come complete with Dual leadds letting you add instantly a second disk drive and manual together with full guarantee on parts and labour.



EXTRA FEATURES OF SOLIDISK DDFS 2.0

With the production of the SOLIDISK DDFS 2.0 ROM we raise the already high standard of the previous DDFS 1.5 ROM.

The larger memory capacity of the DDFS 2.0 has allowed inclusion of a Wordprocessor and complete Disk Toolkit as well as a totally new concept in the working of the Disk Directory.

This will, we feel, make the SOLIDISK DDFS 2.0 ROM the most powerful Disk System currently available.

1) EXTENDED NUMBER OF FILENAMES
The standard number of filenames on the BBC microcomputer is limited to 31on most Single Density DFS's. This usually presents no problem on a system using 40 track drives but when using either 80 track drives and/or a Double Density Filing System this number will quite often be reached with a lot of the disk space still unused.

The SOLIDISK DDFS 2.0 ROM uses a unique and novel way to circumvent this shortcoming as every time a catalogue becomes full a new one is created. This gives the possibility of having up to 1502 filenames on a normal 80 Track Double Sided disk. Even with this large number of filenames worst case access taking only just over 2 seconds. Obviously with large files and a lesser number of filenames the access time decreases dramatically.

The way that the DDFS 2.0 ROM operates means that ordinary single catalogue discs are completely compatible with our system and, indeed, will be upgraded to multi catalogue once the number of filenames exceeds 31. This means no special formatting is necessary and that the disc remains compatible with other Single Density DFS's.

2) DISK TOOLKIT
Included on the SOLIDISK DDFS 2.0 ROM is a powerful disk repair facility. It is possible to read a complete track into memory and to repair or modify the data before restoring the track to the disk. If only one sector needs to be worked on then this too is possible with the Disk Sector Editor contained in the DDFS 2.0.

A powerful Disk Copy routine is also included to allow mmost non-standard format disks to be duplicated. This routine will also displaay the Sector I.D. Fields so that it is possible to see the makeup of the track being copied.

3) WORDPROCESSOR:
SOLIDISK DDFS 2.0 ROM contains a Word Processor with many excellent features such as 80 column screen, automatic on screen justification, Search and Replace, Block Move and Copy etc.

SOLIDISK+MITSUBISHI BIG DEAL:

This is exactly what you would receive:

— one double sided 80 track Mitsubishi M4853 disk drive, cased in beige.
— one Solidisk Double density disk interface (complete with STL DDFS 1.5 ROM) as described overleaf, giving a total capacity of 640K.
— Dual leads and instruction manual.
— 5 Software Diskettes containing a selection of the most prestigious programs written for the BBC.
— full one year guarantee.
—all for £209.95 including VAT and post and packing.

THE HARDWARE:
As described earlier and opposite.

THE SOFTWARE:
A selection of 6 programs based on ease of use, and popularity. All efforts are made so that you would not have to read the manual twice.
All programs feature on screen help (word processor) or option menus throughout. Mode 3 is used throughout whenever possible for good visual representation.

— Solicalc —
A Disc Based electronic spreadsheet made only possible with the speed of Solidisk DDFS. The sheet size can be as big as 170 kbytes. Written in modules, it is easily upgradable. Mode 3 screen. Goto, Calculate, Replicate, Automatic Header etc.

— Solidisk Datafile —
A fast, efficient and random access Database. Solidisk Datafile features:
— Compact size.
— 80 column screen throughout.
— 15 fields of 60 characters per card.
— Unlimited number of cards.
— Powerful Screen Editing allowing VERY FAST data entry on new cards or data correction on old cards.
— All Maths functions on ALL fields admitting Symbolic Variables (like A, B, C, D etc) for entering formulae.
— Special SORT program making use of any free disk space to avoid swapping cards.
— Standard options include View, Print using Tabulation, Print Labels, Search on any number of criteria and repeat on count, Amend, Create, Spool to disk, Append and Mailmerge with Solidisk Word Processor (requires EPSON compatible printer).
— Ability to read BEEBUG's Masterfile and possibly other systems later on.

— Solidisk wordprocessor —
On screen help, Wordstar style cursor editing and control keys, on screen justification while you type, Block commands, Quick commands and dot commands for mailmerge. Future development will allow reading Wordstar text from the Z80 second processor. Solidisk can offer Laser Typesetting and Page Planning service: it costs you only £1.00 for typesetting 1×A4 page (around 4,000 characters) from disk received by MODEM.

— Stock control —
useful for small businesses. Features include menu driven, easy to follow instructions, easy categorising. Stock evaluation reports and inventories, together with price lists and reorder forms can be printed automatically as requested.

— Silexicon — the most successful spelling checker with English, French and German dictionaries, together with self generating capability.

— Macrobasic —
a BASIC program generator capable of using bits of old programs to create new ones. Clever ideas — clever ideas of making them work!

Please note that this software is only free as prt of the package deal. It is otherwise avaiable at a cost of £14. Customers who would prefer the DFDC version of our disk filing system (see earlier) can purchase the package deal with this option for an extra £10.
What we may need to tell you is that the price is also agreeably low — check what we offer against any of our competitors — which all adds up to a high degree of sophistication affordable to students and businessmen alike.

48 HOURS DELIVERY CREDIT CARD SERVICE: RING SOUTHEND (0702) 354674 (10 lines)

SOLIDISK LOCAL EXPERTS

We have local people able to fit your equipment FREE OF CHARGE in all of the following towns. If your area is not mentioned ring the office!

BASILDON
BEXLEY
BIRMINGHAM
BOSTON
COVENTRY

HODDESDON
KINGSTON
LEIGHTON BUZZARD
LIVERPOOL
LONDON

NEW MALDEN
NEWTOWNARDS

NOTTINGHAM
PETERBOROUGH
READING
SHEFFIELD

TODDINGTON
WARDLE
WANTAGE
WIMBORNE
WOKING
WALES

PRICE LIST — INCLUDES VAT & P&P

	£
SIDEWAYS RAM:	
SWR16 16K ADD-ON	43.65
SWR32 32K ADD-ON	59.95
S/D128 128K ADD-ON	150.95
S/D256 256K ADD-ON	N/A 256.00
EXTENSIONS:	
16-32K FULL EXCHANGE	19.00
16-128K FULL EXCHANGE	110.00
32-128K	95.00
SOLIDISK DFS:	
STL DDFS DISK UPGRADE	39.95
STL DFDC (goes with Acorn DFS)	49.95
DISK DRIVES:	
MITSUBUSHI 2×80 (INC LEADS	163.00
MITSUBUSHI TWIN + MANUAL)	323.00
COMPLETE SYSTEMS: (ie. DRIVES + DDDFS)	
MITSUBISHI 2×80	200.99
MITSUBISHI TWIN	353.00
CPU	
65-C-02 CHIP	12.00
65-C-02+ SOFTWARE	14.00
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5 × 2764 PACK	36.00
3 × 27128 PACK	39.95
EPROM PROGRAMMER	20.95
EPROM ERASER — UVIPAC	20.95
DATALIFE DISKS	
MD525 SS/DD 40TRK	17.00
MD550 DS/DD 40TRK	23.00
MD577 SS/DD 80TRK	23.00
MD557 DS/DD 80TRK	29.00
WAB M16A DS/DD 80TRK	24.00
SANYO COLOUR MONITORS	
14"— NORMAL RESOLUTION	210.00
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HIGH RESOLUTION	410.00
EPSON PRINTERS	
RX80 MATRIX PRINTER	248.35
RX80FT MATRIX PRINTER	282.85
FX80FT MATRIX PRINTER	386.35
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ELECTRON DISK INTERFACE	40.95
Typesetting per A4	1.00

TO: SOLIDISK 17 SWEYNE AVENUE SOUTHEND-ON-SEA ESSEX SS2 6JQ
Please send me:

QUANTITY	ITEM	TOTAL
....	....	£............
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MY BARCLAY/ACCESS CARD NO. IS ....

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VOLUME DISCOUNTS AVAILABLE — PHONE SALES OFFICE (0702) 354674 (10 LINES)

INTRODUCING THE DFDC!

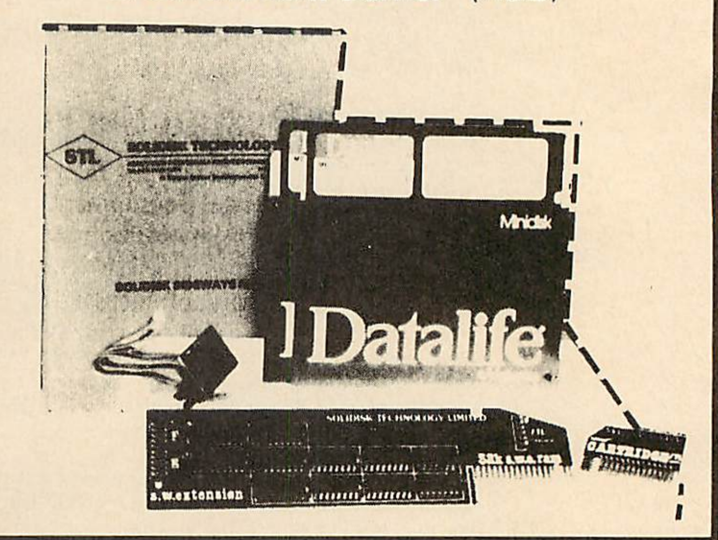
For those who already have the Acorn DDFS installed in their computer and would like the advantages of increased speed and storage capacity that Double Density systems offer SOLIDISK have introduced a totally new concept in the shape of the DFDC!

The DFDC board simply sits in place of the 8271 FDC, this being reinstalled in the DFDC boaard. Now all that needs to be done is to install the DDFS ROM into a Rom Socket, to the right of the existing Acorn DFS, and two other minor connections.

Great Value at £49.95 inc.

HAS YOUR BBC COMPUTER GOT ITS SIDEWAYS RAM BOARD YET?

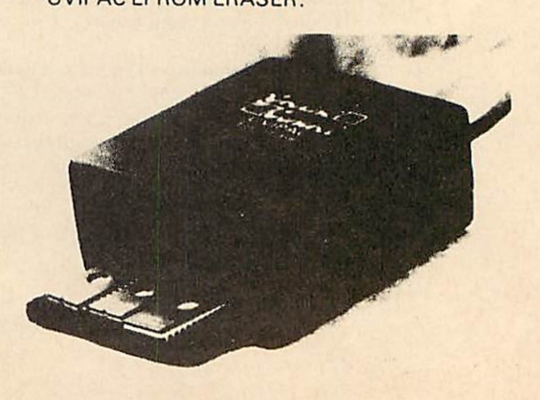
"Break the Ram Barrier" (A&B)



HOW TO ORDER?

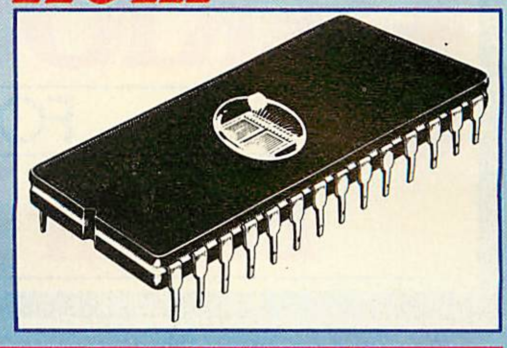
You can order any item using the coupon. Prices are inclusive of VAT, post and packing. Access and Barclay card holders can place their order by phone.
Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

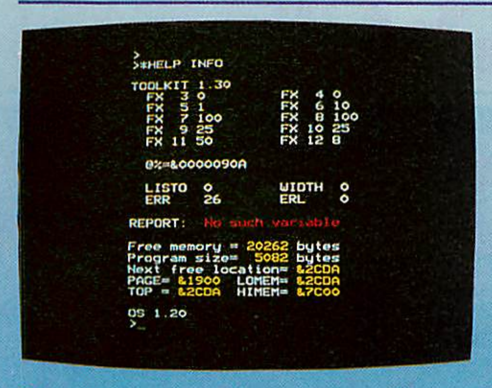
OTHER PRODUCTS FROM SOLIDISK:
UVIPAC EPROM ERASER:



TOOLKIT ROM from BEEBUGSOFT

BASIC Programmer's Aid for the BBC micro





- **27 new commands to make life easier**
- **Saves hours in program development and debugging**
- **Supports both cassette and disc systems**
- **No command name conflict with other Roms**
- **Ideal for expert and novice alike**
- **Fitting instructions and a 32 page manual supplied**
- **You'll wonder how you ever managed without it**

SPECIAL FEATURES INCLUDE

SCREEN EDITOR An extremely powerful editor, allowing the use of cursor keys to list a program line-by-line in either direction and move to any part of a program to overtype or insert new code and corrections.

```
Editing lines 5 to 1470

   1 String search
   2 Search and replace
   3 Move lines
   4 List procedures and functions
   5 List A% to Z%
   6 List numeric variables
   7 List string variables
   8 List arrays
   9 Change edit range
   0 Edit program

   ESCAPE to exit

 Enter option: 1
Search string:  X%

  640 DEFPROCEVAL(U%,V%,W%, X% ,Y%)
  670 IFB%< X% A%=U%+2:ENDPROC
 1450 LOCAL X% ,Y%
 1460 $buf%=cmand$: X% =buf%:Y%=buf%DIV2
56

 Enter option: _
```

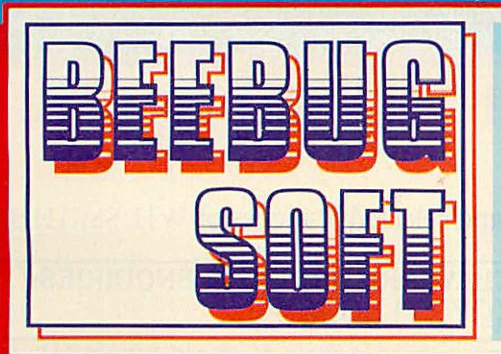
ERROR DETECTION Powerful facility to trap an error in a Basic program as it runs. It will then automatically enter the Screen Editor, display the line in error and position the cursor close to the statement at fault.

> "TOOLKIT is an essential utility for all Basic programmers using the BBC Micro. . . .an indispensable aid packed full of powerful utilities."
> EDUCATIONAL COMPUTING MARCH 1984
>
> ". . . highly recommended,"
> PCN MARCH 17 1984

> "The Beebugsoft Toolkit costs £27 and in my opinion is worth every penny. Since it has been installed in my BBC it has been used extensively and I can find no fault with it. Highly recommended to lazy programmers!"
> COMPUTING TODAY JUNE 1984

COMMANDS

*CHECK	Verify a program or data in memory with disc/cassette.
*CLEAR	Clear all variables including integers.
*EDIT	Enter full screen editor.
*FREE	Display free memory and pseudo variables.
*HELP INFO	Display a screenful of useful system information.
*MEMORY	Display memory contents.
*MERGE	Merge a program in memory with one on disc/cassette.
*MOVE	Move program to run at specified address.
*NEW	As NEW, but can be issued from within a program.
*OFF	Cancel enhanced error handling.
*OLD	As OLD, but can be issued from within a program.
*ON	Auto error handling - enters editor at line in error.
*PACK	Efficient program compactor.
*RECOVER	Intelligently recover bad programs.
*RENUMBER	Allow partial renumbering.
*REPORT	Extended error reporting facility.
*SCREEN	Screen dump to cassette or disc.
*UTIL	Display utilities menu.
*UTIL 1	String search.
*UTIL 2	String search and replace.
*UTIL 3	Move Basic program lines.
*UTIL 4	List procedures and functions.
*UTIL 5	List values of A% to Z%.
*UTIL 6	List numeric variables.
*UTIL 7	List string variables.
*UTIL 8	List names of arrays.
*UTIL 9	Set up range for utilities 1 and 2.



PRICE £27.00 INC. VAT
Available from your local dealer and selected branches of W.H. SMITH'S



Access Orders and enquiries: Tel: ST. ALBANS (0727) 60263

Mail order (Post Free) to:

BEEBUGSOFT, Mailing Dept. 13 P.O. Box 109, High Wycombe, Bucks.

Any improvement on Britain's No.1 word processing ROM...

WORDWISE was the very first ROM based product to be made available for the BBC computer and over the last couple of years it has become the most popular word processing system for the BBC machine with almost 50,000 chips now sold.

It has consistently received excellent reviews for its ease of use and speed. It takes only minutes for the user to become familiar with a powerful professional word processing system.

WORDWISE PLUS is now available extending the original program in many unique directions. Not only is the program now twice the size but the package includes two completely new manuals—an introductory manual that gently introduces the newcomer to word processing with WORDWISE, and a reference manual listing all the commands.

THE WORDWISE PLUS PACKAGE CONTAINS

1. **16K ROM**
2. **SPIRAL BOUND REFERENCE MANUAL (180 pages)**
3. **INTRODUCTORY MANUAL (56 pages)**
4. **KEYSTRIP**
5. **TYPING TUTOR PROGRAM (On cassette)**
6. **EXAMPLE TEXT (On cassette)**
7. **EXAMPLE PROGRAMS enabling mail merging, index generation, etc.**

WORDWISE PLUS is completely compatible with all older versions and is able to use existing WORDWISE files without modification.

WORDWISE PLUS FEATURES

Over the last couple of years we have received countless suggestions for ways of extending or adding new facilities to WORDWISE. It soon became obvious that we would not be able to implement every single suggestion. Indeed, each person uses a word processor in a different way—each individual has differing requirements—a feature that one person may think essential another may have no need for.

We have overcome this problem in two ways. Firstly we have included the most commonly requested additions and improvements. A number of new editing features and a few more embedded commands have been added.

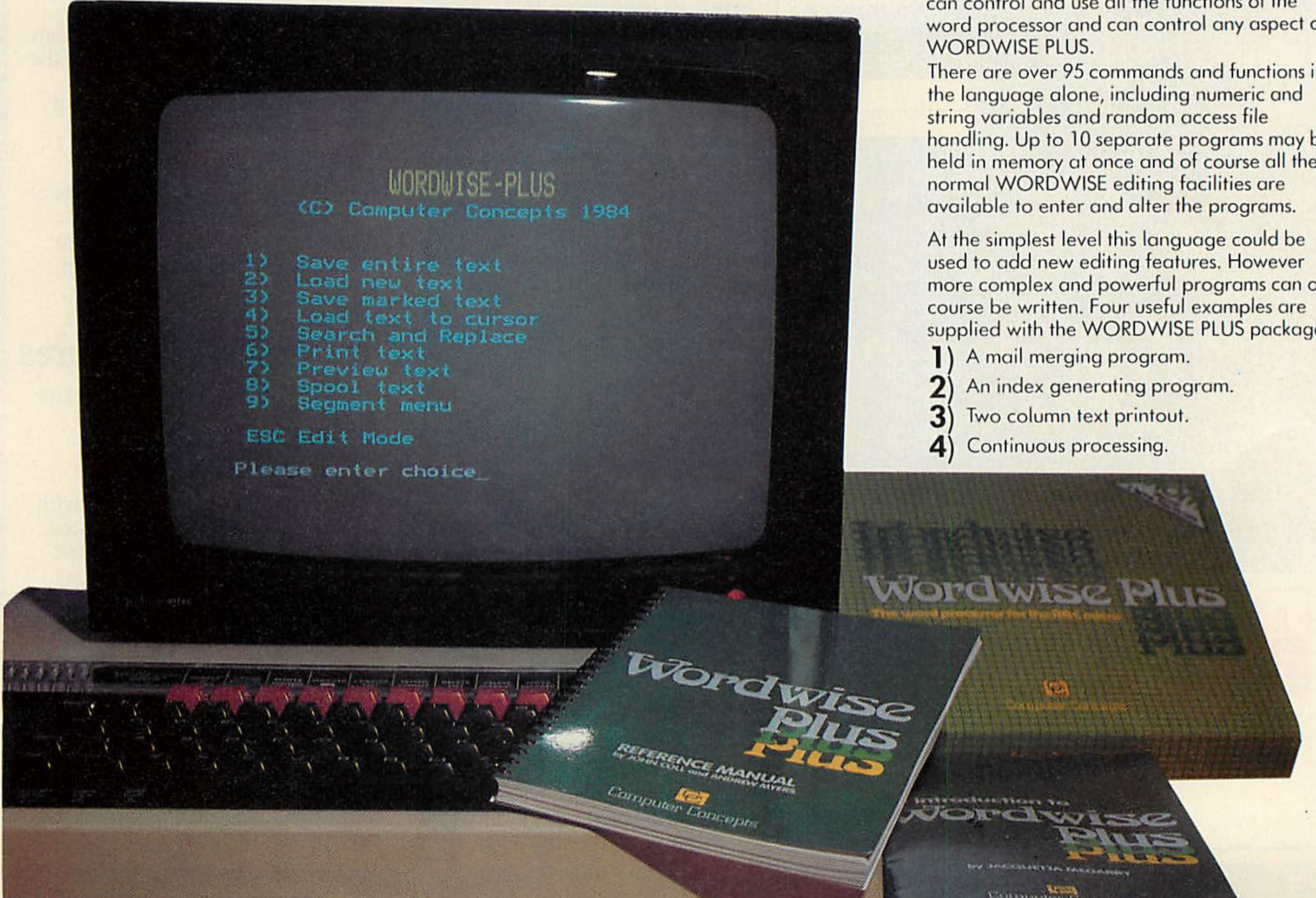
Secondly a unique BASIC-like programming language has been incorporated. This facility enables the capabilities of this word processor to be extended in an infinite number of ways.

The language itself has been designed, like WORDWISE, to be simple to use and understand. Many of the commands look and act like BASIC commands and so will be familiar to many users. However the language can control and use all the functions of the word processor and can control any aspect of WORDWISE PLUS.

There are over 95 commands and functions in the language alone, including numeric and string variables and random access file handling. Up to 10 separate programs may be held in memory at once and of course all the normal WORDWISE editing facilities are available to enter and alter the programs.

At the simplest level this language could be used to add new editing features. However more complex and powerful programs can of course be written. Four useful examples are supplied with the WORDWISE PLUS package.

1) A mail merging program.
2) An index generating program.
3) Two column text printout.
4) Continuous processing.



...Must Be A Plus

Word Processing With Wordwise

All the advantages of a ROM—instantly available. One command and your BBC machine becomes a powerful word processing system.

Fast and very simple to use.

The more complex commands are menu driven, enabling those totally unfamiliar with this software to use these more powerful features straightaway.

The function keys are used to full effect with a keystrip clearly showing each function.

Block copies and moves. It is possible to mark any part of your text, this marked section may be instantly moved or copied to any other part of your text. This cut and paste type of operation is a vital part of all word processing operations and with WORDWISE it is simplicity itself.

Automatic headings, footings and page numbering. When printing a document many pages long it is possible to have WORDWISE number the pages for you and put any heading or footing line on each page.

Unique word counting feature. Ideal for journalists, it constantly displays the current number of words typed. It also allows word counting for specific sections of a document.

Works with all filing systems, such as DISC., CASSETTE., and the new ADFS. Works with any printer that works with the BBC machine (most do) and is able to access the special features of any printer (italic, subscripts, etc.). There is no need to buy additional printer driver programs.

Here are a few of the things that have been said about WORDWISE.

"WORDWISE offers an extremely user friendly program . . . it would make an excellent choice for someone rather apprehensive about word processing." **. . . E & CM**

"WORDWISE has won a devoted fan club because of its flexibility and ease of use." **. . . Practical Computing**

"On the whole WORDWISE is an excellent wordprocessor . . .WORDWISE is thoroughly recommended." **. . . VIEWFAX 258**

"WORDWISE is straightforward, friendly and excellent value." **. . . Practical Computing**

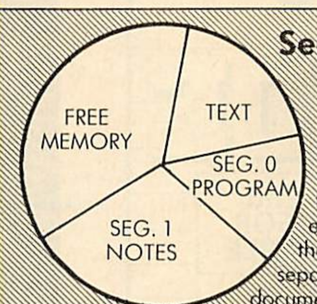
". . . it is ideal for the home hobbiest and small businessman." **. . . A & B Computing**

Word Processing with Wordwise Plus

WORDWISE PLUS still has WORDWISE as its core therefore it is still very user friendly and retains all the features that made WORDWISE the most popular word processor. It now has many new additions making this the most flexible word processor yet.

WORDWISE will continue to be sold alongside WORDWISE PLUS. For those more specialised users who require the added flexibility here are a few of the new features.

Segments



When using WORDWISE PLUS, the BBC's memory is divided between your text and up to 10 segments. Each segment may contain either a program or just normal text. It is therefore possible to store and edit up to 11 separate documents in memory, or 1 document and 10 programs, or any mixture.

Often when writing letter or articles it is useful to keep a notepad, outlining what you intend to write. In WORDWISE PLUS one of the segments could be reserved for an electronic notepad. It would be a simple matter to switch your 'notepad' and your main document with just a single key press.

Some of the New Editing, Embedded Commands and Wordwise Extensions

WORDWISE PLUS works with the 6502 2nd processor. This allows more text to be stored in memory and 80 column previewing no matter how full memory is.

New embedded command FI will fully indent text against the right margin.

New commands for underlining and bold printing. The bold and underline effects are shown on screen—and it is a simple matter to configure these features for any printer.

Saving and loading of text is now up to 10 times faster on disc, and now the computer gives the user a warning if a document is going to be overwritten on the disc or in memory.

There is now a working filename—i.e. WORDWISE remembers the name of the current document being worked on.

New command deletes markers automatically.

It is now possible to print or preview a file directly from disc without having to load it first.

New embedded command 'PS' allows strings to be inserted into the text when it is printed.

New embedded command 'PF' will read a document from file when printing and interpret any embedded command in that file.

Improved search and replace facilities now include wild-cards.

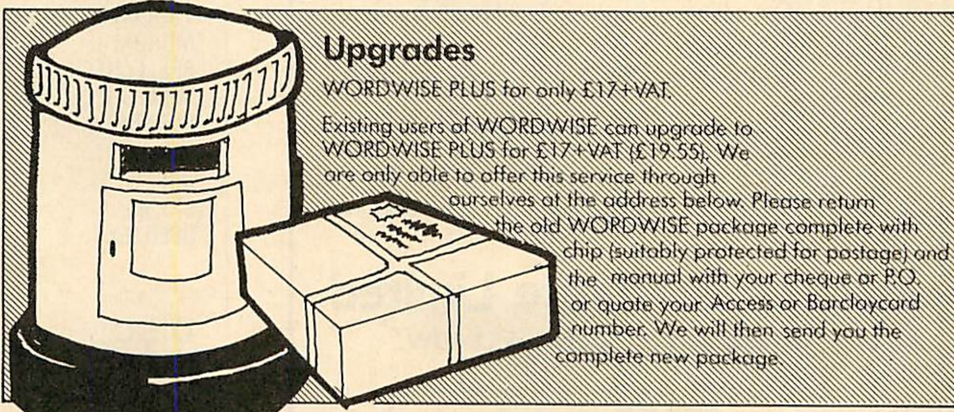
Example Programs Supplied With Wordwise Plus

1) A mail merging program that allows names and addresses to be added to a standard letter. This is a relatively easy job with this language.

2) An index generating program. This finds keywords and generates a separate index listing the word and the page numbers where the keywords occurred.

3) Two column printout. This program will print your text in two columns across the page.

4) Continuous processing. This enables the disc user to process and edit extremely large documents spread over several files as if it were one continuous document in memory.



Upgrades

WORDWISE PLUS for only £17+VAT.

Existing users of WORDWISE can upgrade to WORDWISE PLUS for £17+VAT (£19.55). We are only able to offer this service through ourselves at the address below. Please return the old WORDWISE package complete with chip (suitably protected for postage) and the manual with your cheque or P.O. or quote your Access or Barclaycard number. We will then send you the complete new package.

In The Near Future

HI-WORDWISE for 2nd processors that allows even more user memory, supplied on disc for less than £5 to WORDWISE PLUS owner.

A FAST SPELLING CHECKING PROGRAM.

Both WORDWISE and WORDWISE PLUS are available from all good computer dealers. Alternatively you can obtain these directly from Computer Concepts.

WORDWISE PLUS £49+VAT (£56.35)
WORDWISE £39+VAT (£44.85)







Computer Concepts, Gaddesden Place,
Hemel Hempstead, Herts HP2 6EX
Telephone: (0442) 63933



FEBRUARY '85

TECHNOMATIC

BBC Computer & Econet Referral Centre

17 Burnley Road, London NW10 1ED Tel: 01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and 15% VAT to order value

ACORN COMPUTER SYSTEMS

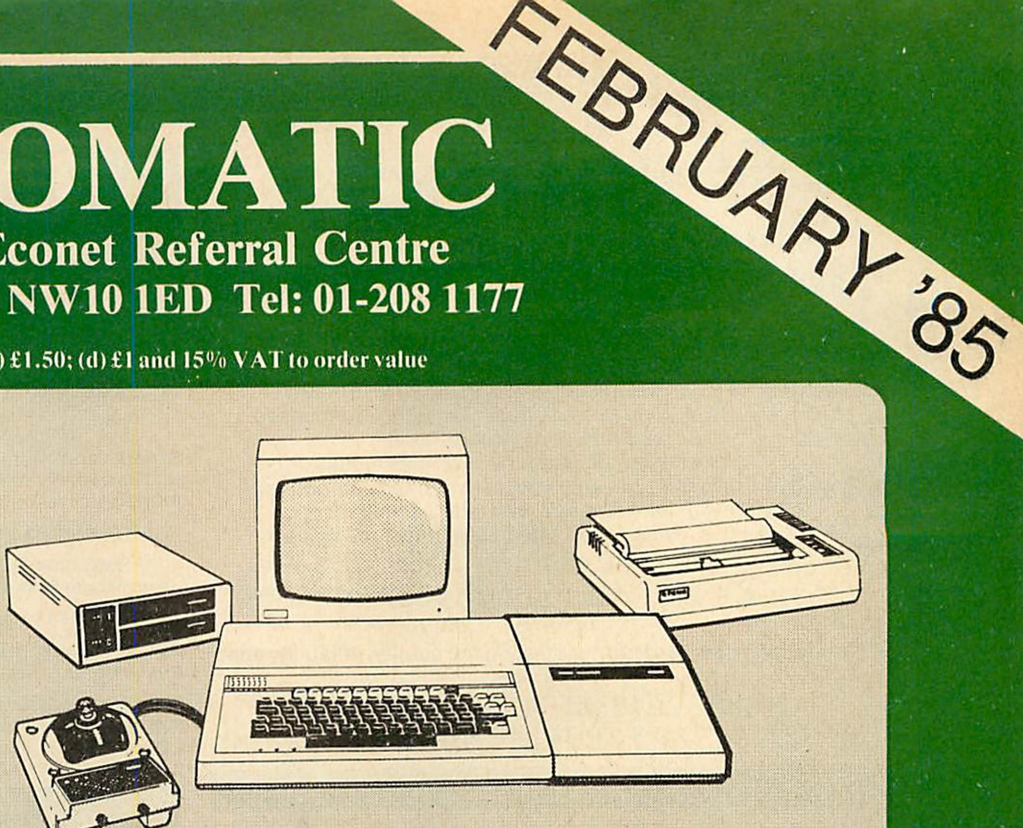
BBC Model B Special Offer	£320 (a)
BBC Model B + Starter Pack	£348 (a)
BBC Model B + DFS	£409 (a)
BBC Model B + Econet	£389 (a)
BBC Model B + Econet + DFS	£450 (a)
BBC Dust Cover	£4 (d)
Pair of Joysticks	£14.50 (d)

UPGRADE KITS

A to B	£65 (d)	Installation	£20
ACORN DFS Kit	£95 (d)	Installation	£15
Econet Kit	£55 (d)	Installation	£25
Speech Kit	£47 (d)	Installation	£15
BASIC II Rom with user guide			£22.50
1.2 O/S Rom	£7.50	DNFS Rom	£17.50
4816AP Memory upgrade RAM			£2.00

ECONET ACCESSORIES

Terminator (Two reqd per installation)	£31 (c)	File Server Level II	£216 (c)
Clock with psu	£39 (c)	10 Station Lead Set	£26 (c)
Printer Server Rom	£41 (c)	Extra Econet cable	£1.50/m (d)
File Server Level I	£86 (c)	Econet User Guide	£10 (d)

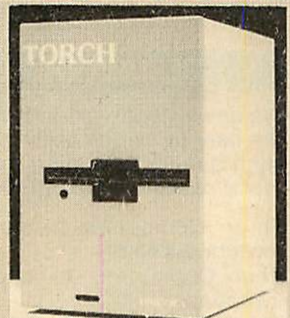


A BBC Family System

ACORN BITSTICK

The Acorn adaptation of the renowned 'Bitstick' graphic CAD package — the "expensive joystick" that lets you exploit the powerful capability of the BBC micro to the full. The joystick is of a robust design which achieves remarkable precision without fiddliness. Total control is available from the joystick using the on-screen menu. It can draw freehand or follow lines of shapes chosen with high accuracy and colours can be chosen from a palette displayed on the screen. Any part of the drawing can be magnified, by a virtually unlimited number of times, and upto 48 drawings can be saved on a single disc. The discs use a visual library system for easy identification. Inspite of its powerful features, the Bitstick is extremely friendly and easy to use, due to menus being displayed on the edge of the screens. £325 (a)
FX80 dump routine for the bitstick available.

TORCH UNICORN PRODUCTS



The TORCH Unicorn system has been in the field for over two years and is now a proven Z80 system for the BBC. It gives you the potential to expand which no other system can currently offer. You can expand a single system with a 20Mb Hard Disc, have the processing power of a 32bit 68000 cpu with 256K ram and a UNIX operating system, or set up a network of upto 254 machines. All these capabilities are available NOW.

TORCH UNICOMM

For the Torch Z80 card user, comes a superb communications package. A BT approved modem using 1200/75 and 1200/1200 baud is supplied complete with BBC RS232 cable. Three superb software packages in CP/M included, clearly demonstrate TORCH's experience on the communications scene: UNIVIEW for PRESTEL type use, allowing saving of frames, downloading of files etc. UNITERM is a sophisticated terminal emulator. UNIMAIL is an amazing package specifically for TORCH users. Among other facilities, it allows messages and files to be accessed from distant machines — access to files can be controlled by hierarchial passwords. Hardware + software: £159(a)

ACORN Z80 2nd Processor

This processor converts your BBC into a complete business micro with all the computing power a professional would need. The system is CP/M based and is supplied with a very extensive software package. The package includes three office productivity programs, (memoplan, fileplan and graphplan), Systems generator program, three programming languages .plus the ACCOUNTANT business program. Software is accompanied by extensive manuals that not only get you started but also answers your whys and hows.
All for only £399 (a) (incl VAT)

See our section on CP/M software for other packages available for use with this processor.

ACORN 6502 2nd Processor

This processor is designed for the serious computer user who wants to get even more out of his computer. This processor provides increased memory — allowing up to 44K for Basic programs and up to 60K for assembly language programs, regardless of screen mode in use. (ideal for VIEW). An increase in speed means that programs run up to 50% faster. The second processor/BBC combination offer computing power comparable to systems costing twice as much. £175 (a)

TORCH GRADUATE SYSTEM

The ultimate upgrade — converts your BBC into a powerful 16 Bit business computer and makes it disc and hardware compatible with the IBM PC. (will run Lotus 123!). With 256K RAM and single/dual drives, it simply connects through the 1Mhz bus. (The disc drives can be used in both BBC and IBM mode, without requiring a disc interface.) The top-of-the-range Model G800/2 comes complete with the superb Xchange range of software, and includes a full-feature word processor, a financial planner, a database and a business graphics package — all 'linkable'.
G800/2: £945(a) Full Spec. & prices on application.

Z80 Card ZEP100 with PERFECT Software Packages + Z80 Basic	£275 (a)
Z80 Disc Pack ZDP240 with software as above	£675 (a)
20Mb Hard Disc + 1 × 400K Floppy Drive	£1,950 (a)
UNICOMM Communications Package + modem	£159 (a)
Unicorn 68000, Unix OS/Z80B/256K, 20MB Hard Disc, 400K Floppy	£2995 (a)

PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

DOT MATRIX

KAGA TAXAN:

* Epson Compatible Control codes
* 80 or 156 Column
* NEAR LETTER QUALITY Print using 23 x 18 matrix
* Text Modes include Normal, Italic, Enlarged, Condensed, Super/Sub Script, Proportional
* Dot Addressable graphics in various modes
* 3K buffer which can also hold user defined characters
* Extra socket for eprom with custom made font
* Friction & Tractor feed with built in paper roll holder

KP810 (80 column) £255 (a)
KP910 (156 column) £359 (a)

EPSON:

The industry standard printer offering the quality, reliability and versatility.

RX80T £215 (a) RX80FT £225 (a)
RX100 £345 (a) FX80 £315 (a) FX100 £435 (a)

DAISY WHEEL

BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Porportion spacing • Underline • Bold & Shadow printing • super/Sub script + many other features.

BROTHER HR15 £340 (a)

JUKI 6100: • 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 £340 (a)

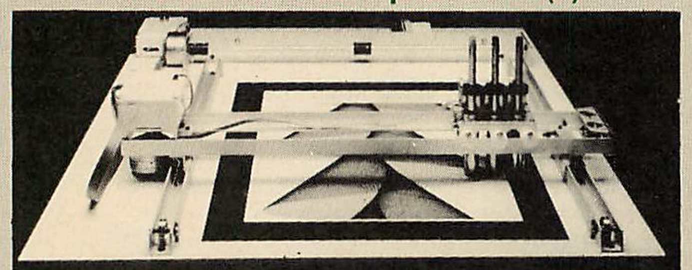
ACORN VIEW PRINTER DRIVER GENERATOR

This printer driver generator will end your search for the printer driver that suits your printer. You can fully exploit all the features of your printer by generating a driver to suit your particular printer. All you need to do is to answer a series of simple questions relating to your printer and you will have your driver. You can generate as many types of printer drivers as you require. Screen driver supplied with the printer driver enables highlighted text to be displayed on the screen showing the effects of underlining, bold, superscripts, subscripts, italics etc. MPRINT program enables more than one file to be printed at a time including the current text. Comprehensive manual supplied with the disc. **£10(d)**

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete all accessories.

Workstation Complete £490(a)



Basic Plotter **£270(a)** Opto Sensor **£72(c)**
Drill/Router Attachment **£79(c)**
Power Supply: PS12V **£42(c)** PS24V **£78(c)**

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON

32K Internal Buffer Parallel **£75(b)** NEW
Paper Roll Holder **£17(d)** FX80 Tractor Attachment **£37(c)**.
Interfaces: 8143 RS232 **£28(c)**; 8148 RS232 + 2K **£57(c)**; 8132 Apple II **£60(c)**; 8165 IEEE + Cable **£65(c)**.
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 **£5.00(d)**; RX/FX/MX 100 **£10(d)**;
FX80 Dustcover **£4.50(d)**

KAGA TAXAN: RS 232 Interface + 2K buffer **£85(c)**; Ribbon KP810/910 **£6(d)**

JUKI: RS232 Interface **£65(c)**; Spare Daisy Wheel **£14(d)**; Ribbon **£2.50(d)**; Sheet Feeder **£199(a)**; Tractor Feed Attach **£99(a)**

BROTHER HR15: Sheet Feeder **£199(a)**; **Ribbons Carbon or Nylon £4.50(a)**

BBC Printer Lead: Parallel (42") **£7(d)**; Serial **£7(d)**
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):
2000 sheets 9.5" x 11" **£13(b)** 2000 sheets 14.5" x 11" **£18.50(b)**
Labels: 2-3/4" x 1-7/16" in quantities of 1000
Single Row: **£5.25/1000 (d)**; Triple Row: **£5.00/1000 (d)**

PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. it can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. In networked systems it can eliminate the printer server unit. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

TSB 64 Buffer/Sharer £245(a)
Cable Set £30

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No power required.

Three Computers to one centronics printer (all 36 lines switched) **£65(b)**
Four Computers to one centronics printer (all 36 lines switched) **£79(b)**
Three Computers to one serial printer/modem (all 25 lines switched) **£59(b)**
Four Computers to one serial printer/modem **£69(b)**
BBC Cable Sets 3 way **£22(c)** 4 way **£27.50(c)**

Computer Sharer:
Allows one computer to be connected to two parallel printers fitted with cable for the BBC computer **£19.50(b)**.

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 x 192mm + menu area. Comes complete with a CAD package. **£110(b)**.

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

MONITORS

All monitors supplied with BBC lead

MICROVITEC

14" RGB

1431 Std Res **£165(a)**; 1451 Med Res **£240(a)**
1441 Hi Res **£399(a)**

14" RGB with PAL & Audio

These monitors can receive TV programs thru a Video Recorder

1431AP Std Res **£210(a)**; 1451AP Med Res **£280(a)**

All 14" monitors now available in plastic or metal cases, please specify your requirement.

20" RGB with PAL & Audio

2030CS Std Res ; 2040CS Hi Res **£685(a)**

20" RGB

2031 Std Res **£260(a)**; 2040CS Hi Res **£570(a)**

KAGA TAXAN 12" RGB

VISION II Hi Res **£240(a)**
VISION III Super Hi Res **£340(a)**

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£90(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
ZENITH 123 Hi Res 12" Green Screen	£68(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)

BBC Leads Kaga RGB **£5(d)** Microvitec **£3.50(d)** Monochrome **£3.50(d)**

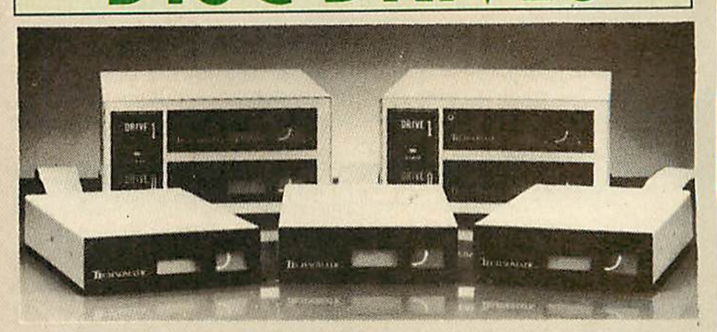
RB2 TRACKER BALL

Marconi with its years of experience making tracker balls for use in Military and Air Traffic Control have developed a quality device for the serious hobbyist, for educational uses, and for low cost CAD/CAM applications. RB2 is a compact, ergonomically designed tracker ball that provides precise positional control and rapid direction changing using a freely rotating resin ball in any direction without the limiting stops or the zero point drift of joystick controls. Three switch buttons enable easy software manipulation to incorporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional control of robots, drillheads etc. RB2 which plugs into the user port is supplied with utlity programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities. User guide includes instructions on writing your own programs for the RB2. **£52(b)**

AMX MOUSE – As seen on the BBC TV Micro progam

Allows advanced features such as Icons. Windows ,etc, replaces cursor keys in ordinary programs, as well as sophisticated CAD design. Comes with the 'AMX Art' CAD Package, as well as a Rom, allowing easy creation of icons, as well as use with Wordwise and View. A screendump for design drawings is included. The Mouse comes complete with CAD Package, ROM and full instruction manual. **£75(c)**

DISC DRIVES



TECHNOMATIC disc drives come fitted with high quality slimline Japanese mechanisms and represent the state of art in disc drive technology. They are built to highest standards and are all tested to their full performance capability before packaging. Single drives are offered with or without integral power supply whilst the dual drives are supplied with generously rated switch mode power supply. Attractively designed steel casings are painted in hard wearing BBC matching paint. All drives can operate in single and double density modes. Drives are supplied with cables, manual and formatting disc and are ready to be fitted to the computer.

Single Drives

1 × 100K 40T SS	: TS55A **£100(b)**;	CS55A with psu **£125(b)**
1 × 200K 40/80TSS	: TS55E **£140(b)**;	CS55E with psu **£150(b)**
1 × 400K 40/80TDS	: TS55F **£145(a)**;	CS55F with psu **£169(b)**

Dual Drives

2 × 100K 40T SS: TD55A with psu **£250(a)**
2 × 200K 40/80T SS: TD55E with psu **£325(a)**
2 × 400K 40/80T DS: TD55M with psu **£350(a)**.
2 × 400K 40/80T DS: TD55MP in flat pack with built-in plinth **£350(a)**.

DISC DRIVE MULTIPLEXER NEW

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.
Write for full details.

TDM 4 Quad Unit (upto 4 computers) **£135(a)**
TDM 2 Dual Unit (2 computers) **£75(b)**

Note: All computers must be fitted with a DFS

3M FLOPPY DISCS



Authorised Distributor
Data Recording Products

Industry standard high quality discs with guaranteed error free performance for life. £1 Wine Voucher with purchases of every 20 discs only until voucher stocks last.

Discs in packs of 10:

40T SSDD **£15(c)**	40 T DSDD **£18(c)**
80 T SSDD **£22(c)**	80 T DSDD **£24(c)**

DISC ACCESSORIES

Single Disc Cable **£6(d)** Dual Disc Cable **£8.50(d)**
10 Disc Library Case **£1.80(d)** 30 Disc Case **£6.00(c)**
Lockable Storage Boxes 30/40 Discs **£14(c)** 100 Discs **£19(c)**

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.
Floppiclene with 20 disposable cleaning discs. **£14.50(b)**.

COMMUNICATIONS

We offer the customer a choice of BT approved modems and suitable communication software, enabling the user to choose an ideal cost-effective system, perfectly suited to his individual needs. We stock modems for every requirement, whether it is for the business, or private user, whether you require access to a public database, bulletin boards or a mainframe, whether for local or international use.

MODEMS

TORCH UNICOMM See our section on Torch for further details.

ACORN PRESTEL The dedicated Prestel adaptor complete with integral, BT approved, auto-dial modem and software in ROM £120(b)

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered £55(c) BBC Lead £6 External PSU £9(c)

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21,V23,BELL 103/113/108 and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel'!). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto-dial/auto-answer makes this modem unique. WS2000 £129(c) BBC Serial Cable £7



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line £30(d). BBC User Port cable (for modem control) £7. **SKI KIT** (Allowing total control of the modem by your computer) £10. **DS1 Disc (for Commstar):** When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling £10.

UNICOM A High Performance, yet low-cost Modem. Features include: Auto-dial & auto-answer, Auto baud rate scan, 75,300,1200 Baud rates with V21, V23 and Bell standards. Sophisticated software in ROM allow many features like: Auto-Dial. Redial, Remote facilities etc. An Auto-Dial disc allows storage of commonly dialled numbers. UNICOM £49.95(b) Unicom ROM £20 Unicom Disc £9.95 Unicom Cable £6(d) Not BT approved

TELEMOD-2 A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 62(b) BBC Lead £7.00

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. £29(d)

TERMI-II A good all round package for communicating with notice boards, electronic mail services etc. Termi is a semi-intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). £28(d)

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). £59(d).

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This enhanced eprom programmer will handle the full range of popular single rail eproms. Its sophisticated menu driven software makes the programming of eproms simple and efficient. Features included in this programmer are normally found in industrial grade programmers costing many times more.

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The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. £112(b)

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ACORN IEEE INTERFACE

This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

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This interface allows the retrieval and storage of data transmitted by both BBC and IBA. There are currently many educational and other programs being transmitted, and this unit will allow their retrieval absolutely free. In 'Terminal' mode, the system receives and decodes pages from both Ceefax and Oracle. (These pages can be stored). In 'Telesoftware' mode, the system can load, run and execute programs that are transmitted. This unit gives you a professional teletext terminal at a cost effective price. £195(b)

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The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.
Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10MByte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. £112(c).

STARdataBASE A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. £75(d)

ROMs/SOFTWARE

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HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52(c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13(d)

WORDWISE One of the most popular word processors for general use £34(d). Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price £16.50(d). If bought with Wordwise: No p&p and only £14.

SPELLCHECK II: A rom based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17000 words on 100K drive. Fully compatible with 6502 second processor. £26(d)

ACORN P SYSTEM: A full implementation of the portable P SYSTEM operating system for the BBC Micro with a 6502 2nd Processor. It includes Filer, Editor, Utilities, and Compilers for USCD PASCAL and FORTRAN 77. This PASCAL is the latest version (IV.1) of the UCSD Pascal Project. FORTRAN is a ANSI Fortran 77 subset.
P-System is widely used by Universities and business software authors because of the facilities offered and the ease of program development and the portability of the final product. £261(b)

ISO-PASCAL: Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with tutorial course and technical manual. £60(b)

ULTRACALC This enhanced version of the original BBC Publications popular spreadsheet rom includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spreadsheets. £69(d)

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £52(d)

BCPL A full implementation of the BCPL compiler language consisting of the language rom, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. £52(b)

BCPL STAND ALONE GENERATOR Utilities in this package enable the programs developed using the BCPL rom to be converted so that they can be run on any BBC micro whether it has a BCPL rom or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

BCPL CALCULATIONS PACKAGE: supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b)

ACORN LISP Rom £43(d)

COMAL Write for details and availability £43(c)

6502 DEVELOPMENT PACKAGE Write for details and availability £43(c)

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DISC DOCTOR Computer Concept's popular disc utility rom which adds 20 commands to the DFS system. £27(d)

DISCMASTER Beebug's a disc utility rom which provides additional DFS commands and utilities including disc menu to automatically RUN/*RUN programs, converting 40 track discs to 80 track and enable dual catalog. £16(d)

EXMON II Updated version of the EXMON rom with facilities including dual screen operation and full screen memory editor. £24(d)

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GRAPHICS ROM Adds 28 new graphic related commands and features include sprites, turtle graphics, rotation, scaling, 3D plotting all using "*" commands. £27(d)

BASIC COMPILER Write for details and availability.

PRINTMASTER This ROM features the most versatile screen dump for EPSON MX/RX/FX80 and Kaga 810 printers. It supports three types of dumps. The first allows any graphics on the screen to be dumped. Colours appear as shades of grey. Any part of the screen can be printed at any position on the paper in any one of four orientations. The screen dump may be magnified by any factor x2, x3, x4 etc. A special feature allows true MODE 7 screen dumps with TELETEXT text & graphics. The second dump allows any text to be dumped whilst the third dump will print the contents of a file on disc whilst the computer is doing other things. This is not all. All printer functions can be called up using the *command. *DEFINE allows the printer to define his own characters and store them. *GPRINT allows printing of enlarged text in any position, orientation, size & shade. *WINDOW allows windows to be defined in any size and position on the screen. Can allow you to do printing as background oepration while the computer does other jobs. **In short this one ROM does it all.** £28(d)

DUMPMASTER Disc based program that produces fast machine code routines for a variety of printers incl. EPSON MX/FX, STAR 910, Seikosha, NEC PC8023, INTEGREX 132A. Dumps in 8 shades in any mode including teletext mode. Snapshot facility allows dumps from games and other programs. £10(d)

MUROM Sound Extension Rom: Helps you create your own tunes and sound sequences either with MUROM's editor and a musical score or using the keyboard to simulate a piano. Edit your creations with the full screen music editor and then switch to envelope editor to tailor the tonal quality and select instrument type. Incorporate the music into other programs or playback with or without MUROM. Instant sound effects can be called from Basic eg *ZAP, *SIREN, *EXPLODE etc. £24(d)

HELP Rom based comprehensive on screen HELP facility to aid and speed up programming. £21(d)

Write for details on specification and availability of the following packages expected to be released shortly:
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MICROTEXT This authoring system developed by the NPL allows production of a wide range of man-computer dialogues. User can draw up a frame made up of text/graphics and combine a series of frames to create modules which are incorporated into a program. An expert in any field can create complete courses of computer based instruction material. Applications include interviewing systems, teaching packages, training courses and interactive demonstrations and simulations. Disc £53(b) Cassette £43(b)

Replica II 40 & 80 Track Versions available. £10.35(d)

Design Design is a second processor which allows information to be displayed in a format suitable for demonstrations, slide projections, handouts or presentations. Graphs, Pie charts & Bar Charts are quickly produced; automatically drawn & scaled. Versatile labelling facility, 24 User defined, 4 large macro characters plus screen dump facilities included. £16.50(d) Disc (80 or 40 Track).

Superplot Superplot is ideal for screen representations of mathematical functions. It will plot on automatically scaled axes, in Cartesian, Polar or Parametric co-ordinate systems and will allow overlapping of graphs. Cass £8.50(d).

Spellcheck I Menu driven spelling checker for Wordwise or VIEW. Dictionary contains 6000 words and is expandable to 1700 on 100K disc. £16.50(d) Disc (80 or 40 Track) Specify whether Wordwise or VIEW.

Masterfile II The new version of the popular general purpose file management system. It allows large amounts of information to be stored and processed. It is extremely powerful yet flexible to use. The disc version allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100K disc. This latest version features many new facilities including use with WORDWIDE/VIEW £16.50(d) Disc (80 or 40T).

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Please specify the type of format (TORCH or ACORN) required.

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RAM: 8K standard power 6264-15 £22.00
8K lower power 6264 LP-15 £25.00

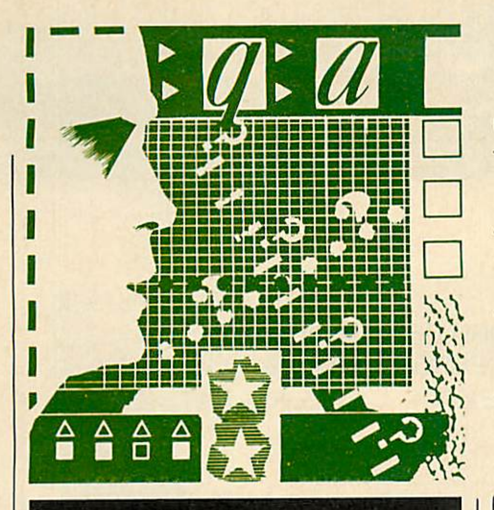
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Martin Phillips takes you through the stages of designing a database, then advises on checking filing systems and saving graphics screens

Developing a database step-by-step

'HOW do I write a sensible routine to edit records easily and conveniently in the database I am designing?' asks Mr Brown from Poole in Dorset.

He has a routine which prints the current version of the record, field by field, on the screen and then prompts for a new version of a field to be input one line below. If no alteration is to be made to a particular field it must be copied using the cursor and copy keys. If only one field needs editing, all of them need to be copied, which could be rather tedious if it is one of many.

The answer takes in several interesting programming techniques, so rather than just giving a direct solution, I shall digress and show how a simple database can be developed from scratch. It can be considerably improved, but at least shows how some of the problems can be overcome, and illustrates how one-dimensional and two-dimensional arrays are used.

These programs will all work on the Electron or the BBC micro with tape or disc. (If using tape, then the inclusion of two lines *OPT1,2 and *OPT2,1 in PROCinitialise helps loading).

The database is presented in the form of an address book, but as it is developed, it becomes less specific and could easily be adapted for a variety of purposes. It doesn't include special facilities such as searching for specific information – these will be added next month.

Listing 1 shows the first attempt at an address book database program, and is divided into six procedures (see yellow pages for this listing and the boxes below and on pages 41 and 43 for information on how to adapt it to versions 2 to 5. Versions 1 and 5 can also be found on our monthly listings cassette).

PROCinitialise sets up the variables needed and defines the background colour. In this program there are three fields; the name, the address and the telephone number, and three arrays are dimensioned, one for each field; name$, address$ and tele$. The maximum number of entries (records) has been set at 100, which was chosen quite arbitrarily. The maximum number of records possible depends on the length of the program, the size of each record and the memory available in the computer. The highest record number is given by the variable A%.

PROCmenu puts a menu on the screen, presenting five choices. The user can input records (from the keyboard), load records (from disc or tape), save records, look at the records or end the program. Once the choice has been made, the program routes to one of four procedures (unless you have chosen to end the program), and

```
   20 PRINT FNfilesystem
   30 END
   40 :
30000DEF FNfilesystem
30010P%=&70:[OPT 0:LDA#0:LDY#0
30020JSR&FFDA:STA&80:RTS:]
30030CALL&70
30040ON ?&80+1 GOTO 30050,30060,
 30070,30080,30090,30100,30110
30050="NONE"
30060="TAPE-1200"
30070="TAPE-300"
30080="ROM"
30090="DISC"
30100="NET"
30110="TELETEXT"
```

Listing 2. A procedure to determine which filing system is currently in use

Filing system checking procedure

A PROCEDURE to determine which filing system is currently in use in the Beeb has been sent in by A J Pilkington from Chesterfield (listing 2). It also works with the Electron, although I was only able to check the cassette and ROM filing systems.

This procedure is a more elegant way of checking the filing system than the crude disc/tape test presented in September, using the OSARGS call with A and Y set to 0. The OSARGS call is directed through location &FFDA, and the results, which will be returned in A, are:

0: no filing system selected.
1: 1200baud cassette filing system.
2: 300baud cassette filing system.
3: ROM filing system.
4: disc filing system.
5: Econet filing system.
6: teletext filing system.

Only lines 30000-30110 should be saved in the procedure library.

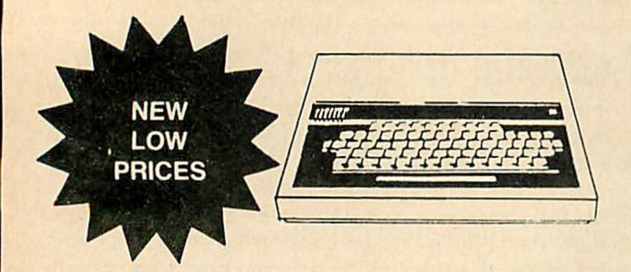
One thing remains to be solved – how to de-select all the possible filing systems so that none are currently selected.

Any answers?

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

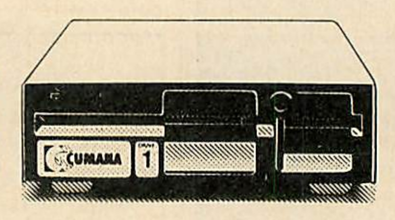
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ACORN Z80 2ND. PROCESSOR	**£346.96** + VAT	= £399.00
ACORN DISC UPGRADE KIT	**£95.00** + VAT	= £109.25

CUMANA CSX 100K 40 TRACK	**£100.00** + VAT	= £115.00
CUMANA CSX 200K 40/80 TRACK	**£135.00** + VAT	= £155.25
CANON 221 400K 40/80 TRACK	**£146.95** + VAT	= £169.00
CANON 221 800K 40/80 TRACK	**£277.39** + VAT	= £319.00

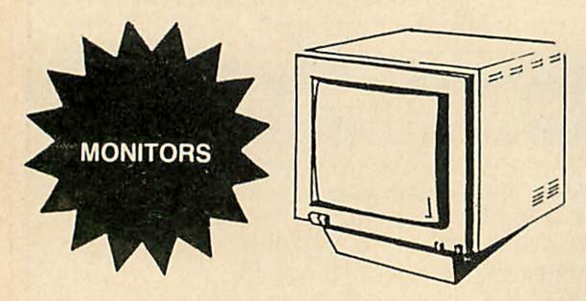




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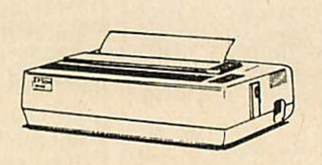
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Version 2
Using listing 1 amend lines 840, 920, 930 and 940, and add new lines 990 to 1080 as follows:

```
 840 IF A%>0 THEN GOTO 880

 920 PRINT" ";name$(N)
 930 PROCprint
 940 PRINT" Tele: ";tele$(N)

 990 :
 1000 DEFPROCprint
 1010 PRINT'" ";
 1020 FOR T=1 TO LENaddress$(
N)
 1030 A$=MID$(address$(N),T,1
)
 1040 PRINTA$;
 1050 IF A$="," AND ASC MID$(
address$(N),T-1,1)>57 THEN PR
INT
 1060 NEXT T
 1070 PRINT'
 1080 ENDPROC
```

after it has routed through one of these it will return to PROCmenu, and the menu will be displayed once more.

PROCinput is the procedure to enter new records from the keyboard, which can only be done if there are less than 100 records already in the file. INPUTLINE is used instead of the more common INPUT, allowing such things as commas and other punctuation marks to be entered into the strings. This is important especially in the address, as it is entered as one line, each part separated by a comma.

PROCload will load a file from tape or disc. A warning question is asked if a file is already present in the machine, as loading a new one will destroy the one already in memory. The file is always saved under the filename ADDBOOK. This could be changed, or the routine extended to allow the user to enter a filename. If a filename is input into the string variable 'file$', then the syntax for line 580 would be:

580 X = OPENUP (file$)

The load and save routines are standard ones, similar to those described in the user guides. INPUT #X name$(N) will load in a string stored in a file that has been opened up in the name ADDBOOK, and put it into that element of the array name$ given by the variable N. PRINT #X name$(N) will save a string stored in that element of the array name$ given by the variable N, and put it in a file that has been opened out in the name ADDBOOK.

PROCsave saves the whole file to tape or disc. Again a couple of lines could be added to allow a choice of filename as described above.

PROClook is the procedure to display each record in turn. It is unsophisticated, but will print out the data one record at a time and return to PROCmenu at the end of the file.

Version 2 has a new procedure, PROCprint, to display the address in a more acceptable form. This splits the address into separate lines by checking for commas. Providing a comma does not follow a number, it forces a new line for the next part of the address. It's not foolproof, as it will start a new line after a house number of, say, 10A. The answer here is to improve the routine, not put a comma after the number, or disown any friends who live at such awkward addresses. The numbers zero to nine are stored in strings as ASCII codes: zero has the ASCII code 48, and nine has the ASCII code 57. Thus line 1050 determines whether to start a new line or not. It checks first for a comma, then if the previous character was a number.

I then developed the facility to edit existing records (version 3). It would be rather annoying to have to re-enter 100 records simply because one telephone number was incorrect.

The edit routine displays each record individually and the user has four options: quit to return to the main menu; forward to display the next record, backward to display the previous record, and edit to alter that record. The forward and backward routines will 'wrap-around', eg, if the end of the file is reached, pressing forward will display record one rather than simply stopping.

If edit is requested, control in the program goes to PROCeditrecord, which displays each of the three fields one after another. To alter an entry, type in a new one, or copy part of the old entry printed on the line above, use the copy keys. To retain the old entry, press Return. The secret of the edit procedure is that the edited entry is put into a temporary string (A$), and it only replaces the existing one if A$ actually contains an entry, and not just the return character. This is a simple but effective device, and makes editing straightforward. Once the record has been amended, the revised version is displayed on the screen again.

The PROCeditrecord procedure is rather clumsy, and if there were more fields, it would be time consuming. So the next stage of development was to implement a single two-dimensional array instead of a one-dimensional array for each field. This allows the database to become more flexible and

Version 4
Using version 3 make the following changes: delete lines 130, 140 and 150 then add new lines 125, 130, 140 and 150 below. Then delete lines 440, 450, 460 and add new lines 440, 445, 450 and 460 below. Redo lines 610, 620, 630, 740, 750, 760 and 920 as below. Delete lines 1002, 1010, 1020, 1030, 1040, 1050, 1060, 1070 and 1072. Add new lines 1010, 1020, 1030, 1040, 1050, 1060, 1070 and 1072. Finally delete lines 1320 to 1410 inclusive and add new lines 1320 to 1370.

```
  125 DIM data$(3,100)
  130 data$(1,0)="   Name: "
  140 data$(2,0)="Address: "
  150 data$(3,0)="   Tele: "
  440 FOR T=1 TO 3
  445 PRINT data$(T,0)
  450 INPUTLINE data$(T,A%)
  460 NEXT
  610 FOR T=1 TO 3
  620 INPUT #X,data$(T,A%)
  630 NEXT T
  740 FOR T=1 TO 3
  750 PRINT #X,data$(T,N)
  760 NEXT T
  920 PROCprint
 1010 PRINTdata$(1,0) data$(1
,N)
 1020 PRINTdata$(2,0);
 1030 FOR T=1 TO LENdata$(2,N
)
 1040 A$=MID$(data$(2,N),T,1)

 1050 PRINTA$;
 1060 IF A$="," AND ASC MID$(
data$(2,N),T-1,1)>57 THEN PRI
NT'" ";
 1070 NEXT T
 1072 PRINT''data$(3,0) data$
(3,N)
 1320 FOR T=1 TO 3
 1330 PRINT'" "data$(T,N)
 1340 INPUTLINE A$
 1350 IF A$<>"" THEN data$(T,
N)=A$
 1360 NEXT T
 1370 ENDPROC
```

Version 3
Using version 2 make the following alterations: add lines 122, 272, 274, 332, redo line 340 as below, delete lines 930 and 940, then add lines 1002, 1072, and lines 1280 to 1410.

```
  122 VDU 23;8202;0;0;0;

  272 PRINTTAB(5,16)"5 Edit R
ecords"
  274 PRINTTAB(5,19)"6 End"
  332 IF A=5 THEN PROCedit
  340 UNTIL A=6
 1002 PRINT" ";name$(N)
 1072 PRINT" Tele: "tele$(N)
 1280 :
 1290 DEFPROCeditrecord
 1300 CLS
 1310 PRINTTAB(0,1)"Change en
try or press RETURN"
 1320 PRINTTAB(0,3)name$(N)
 1330 INPUTLINE A$
 1340 IF A$<>"" THEN name$(N)
=A$
 1350 PRINT'address$(N)
 1360 INPUTLINE A$
 1370 IF A$<>"" THEN address$
(N)=A$
 1380 PRINT'tele$(N)
 1390 INPUTLINE A$
 1400 IF A$<>"" THEN tele$(N)
=A$
 1410 ENDPROC
```

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be adapted for a variety of uses. The field name can be stored in element zero of the array. In the previous three programs, for convenience, each array started at element 1, eg, name$(1). Actually, in BBC Basic the first element is name$(0).

Version 4 shows how a two-dimensional array can be used. This array is now called data$, and is followed by two numbers. The first refers to the particular *field* – 1 is name, 2 is address and 3 is the telephone number – and the second is the record number. Hence data$(2,5) is the address entry for record 5. Now it is possible to simplify the procedure PROCeditrecord, and use a loop to cycle through the three fields.

The use of a two-dimensional array opens up a further possibility – the number of fields that can be defined in the program. To do this you have to add another procedure that inputs the number of fields and the name of each. This procedure can be entered only if no fields have yet been defined. An existing file loaded in will contain the field names already.

The number of fields is held in the integer variable F%. When saving a file, you must save this number first, because the load routine needs to know how many fields there are before it can load in the data.

Again, the number of fields is limited by the program length, the length of each record and the available memory in the computer – in version 5 there are 10. This version also implements user-input filenames. It has a different file structure to the previous listings, so it's not possible to load in any files saved using these. (This version also appears on our monthly listings cassette – see page 95.)

The next extension to the program would be to include search facilities so that specific enquiries could be made, such as to find the record or records that have 'Smith' in the name field.

Version 5

Using version 4 the alterations are as follows: delete lines 125, 130, 140, 150 and 160, then add new lines 130 and 140. Next delete lines 230 to 340 inclusive and add new lines 220, 225, 230, 235, 240, 245, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, and redo lines 390, 440, 450 and 540. Delete lines 570 to 610 inclusive, then add new lines 570, 575, 580, 585, 590, 600, 610. After deleting lines 720, 730 and 740 add new lines 720, 725, 730, 740, 745. Delete lines 1010 to 1070 inclusive before adding new lines 1010, 1020 and 1030. Finally delete lines 1320 to 1370 inclusive and add new lines 1320 to 1490.

```
130 A%=0: F%=0
140 DIM data$(10,100)

220 PRINTTAB(5,4)"1 Load records"
225 PRINTTAB(5,6)"2 Enter field names"
230 PRINTTAB(5,8)"3 Input records"
235 PRINTTAB(5,10)"4 Save records"
240 PRINTTAB(5,12)"5 Look at records"
245 PRINTTAB(5,14)"6 Edit records"
250 PRINTTAB(5,16)"7 End"
260 PRINTTAB(5,18)"Enter choice"
270 A=GET-48
280 IF A=1 THEN PROCload
290 IF A=2 THEN PROCenterfields
300 IF A=3 THEN PROCinput
310 IF A=4 THEN PROCsave
320 IF A=5 THEN PROClook
330 IF A=6 THEN PROCedit
340 UNTIL A=7
390 IF A%=100 OR F%=0 THEN GOTO 490
440 FOR T=1 TO F%
445 PRINT data$(T,0);
450 INPUTLINE TAB(12)data$(T,A%)
540 IF A%=0 THEN GOTO 570
570 INPUT"Enter filename "file$
575  A%=-1
580 X=OPENUP(file$)
585 INPUT #X,F%
590 REPEAT
600 A%=A%+1
610 FOR T=1 TO  F%
720 INPUT"Enter filename "file$
725 X=OPENOUT(file$)
730 PRINT #X,F%
740 FOR N=0 TO A%
745 FOR T=1 TO F%
1010 FOR n=1 TO F%
1020 PRINTdata$(n,0) TAB(12)data$(n,N)
1030 NEXTn
1320 FOR T=1 TO F%
1330 PRINTdata$(T,0) TAB(12)data$(T,N)
1340 INPUTLINE TAB(11)"?"A$
1350 IF A$<>"" THEN data$(T,N)=A$
1360 NEXT T
1370 ENDPROC
1380 :
1390 DEFPROCenterfields
1400 CLS
1410 IF F%>0 THEN ENDPROC
1420 PRINTTAB(12,1)"FIELD NAME ENTRY"'
1430 INPUT"How many fields? (2-10)"F%
1440 IF F%<2 OR F%>10 THEN GOTO 1430
1450 FOR N=1 TO F%
1460 PRINT"Enter field name ";N;"  ";
1470 INPUT data$(N,0)
1480 NEXT N
1490 ENDPROC
```

Disc full mystery

SIMON Frazer from the Netherlands has a BBC model B with operating system 1.2, Basic 2 and a Watford DFS 1.3, and also a very frustrating problem. I do not know the answer, but hope a more knowledgeable reader might be good enough to provide a solution.

When Simon tries to save his file to disc, he gets a 'disc full' message, even when there is nothing else on the disc. If he then switches to tape, he is able to save the file without difficulty.

Saving graphics screens

YOU can save a graphics screen to tape or disc so that it can be reloaded for later use, as the *SAVE command can be used to record specific areas of computer memory.

To save a screen, the memory area where the screen display is stored must be saved, and this changes depending on the display mode used:

Mode 0 &3000 to &7FFF
Mode 1 &3000 to &7FFF
Mode 2 &3000 to &7FFF
Mode 4 &5800 to &7FFF
Mode 5 &5800 to &7FFF

As you can see, modes 0, 1 and 2 have the same screen memory area, and modes 4 and 5 share another. Therefore the syntax to save a mode 0, 1 or 2 screen is:

*SAVE "screen" 3000 7FFF

and the syntax for a mode 4 or 5 screen is:

*SAVE "screen" 5800 7FFF

where 'screen' is the filename you will use to save the screen display to disc or tape. Notice that the '&' sign is not included in the syntax. This is one of the rare occasions where a number must be given in hexadecimal. The screen will take some time to save to tape, as the mode 0 to 2 screen memory area is 20k long.

To load the screen back in again, first ensure that the same mode has been selected and type:

*LOAD "screen"

No load addresses need to be included as these will be the same as on the *SAVE, and the computer will load back into the same place.

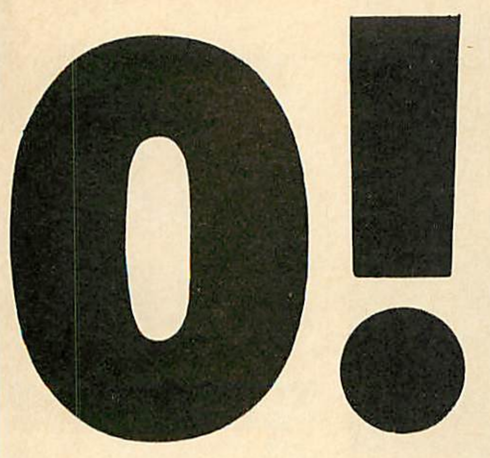
The memory locations store the logical colours, not the actual colours – ie a mode 5 screen will be recreated using black, red, yellow and white. These can be changed to the original colours using the VDU19 code.

Speech marks have been included here to enclose the file name – using an ordinary SAVE command they are essential. They are optional with a *SAVE command and these examples will work perfectly well without them.



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ELECTRON EXTRAS

Expanding your micro may seem fraught with pitfalls – Tessie Revivis guides you through the hazards of add-ons

THE major difference between the Electron and its forerunner, the BBC micro, is that the former supplies just the bare necessities to start you programming, while the latter contains all the possible connections and controlling chips – generally termed the interfaces – you are likely to need, such as a printer port, a user port, a RS423 port, a disc interface, and an expansion bus to allow even more extras to be added.

Although the Electron doesn't have most of these, it does have the one that's probably the most important – the expansion connector. A variety of add-ons, often referred to as peripherals, can be connected to this to increase the capabilities of your Elk step-by-step.

The expansion connector can be found at the rear of the Electron, covered by a plastic jacket. The connector itself is a thin expanse of plastic onto which gold-plated tracks are screened. It's best not to touch these as the body acids on your fingers can damage them. Connecting a peripheral to the Electron generally involves just pushing a female connector onto the Electron's male edge connector. It's impossible to do this incorrectly as the connection is polarised by a slot in the edge connector. The female connector on all peripherals is designed so that a locating pin can only fit into this in a particular way. So forget any fears that adding extra facilities to your Electron through hardware add-ons would be fraught with pitfalls and danger – the procedure is painless!

Having decided you want to expand



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your system, the question will be 'what should I buy?'. This depends on your present and future needs. A little time spent in thought at this stage could well save you money and disappointment later.

First decide why you want to expand your system. Do you want to use joysticks? Perhaps add a printer or some of those fancy sideways ROMs to give your *Electron* wordprocessing capabilities? If you only want to add just one of these now, is it likely that you'll want to add more at a later stage? Do you want to add all of these now and continually expand your system as and when extra hardware becomes available?

These questions may seem obvious but they must be asked and answered at *this* stage for one very important reason – *compatibility.* At present there are several manufacturers producing peripherals for the Electron and each has its own techniques for housing each item, so it's possible that a joystick manufactured by one company will not work with a printer port produced by another, etc.

If you decide that you are only ever going to want to use the joystick interface and not add anything else, then you won't be worried by such details. On the other hand, if you are looking for several items and aiming at continual upgrades and support, the point is very pertinent – and the best answer is to find a reliable manufacturer capable of supplying your needs, and stick with him!

There is a wide range of peripherals available, so let's look at some of the types.

Joystick interfaces

If you're a games addict then you'll find the prospect of adding a joystick to your Electron very appealing, especially as many software items for the Elk are now produced to handle this facility.

Bear in mind the type of joystick you are going to be using – the standard BBC-type 15-pin or the smaller 9-pin Atari-style joystick – as there are interfaces to handle both. Figure 1 shows the difference between the two ports.

If you are going to want to purchase other interfaces it might be worth buying the joystick to suit the interface rather than vice versa.

Sideways ROM boards

The operating system of the Electron is very similar to the latest released for the BBC micro, so it's not surprising that it has software incorporated to handle sideways ROMs. These ROMs, sometimes also called paged ROMs, are designed so that they can be switched in and out of the Electron's memory map to replace the area normally occupied by Basic (figure 2). The operating system can handle up to 16 sideways ROMs, so ask yourself if you are likely to need that many. If it's possible that you will only use three or four, then it might be worthwhile looking for a more compact unit, rather than paying for twelve sockets you are unlikely to use.

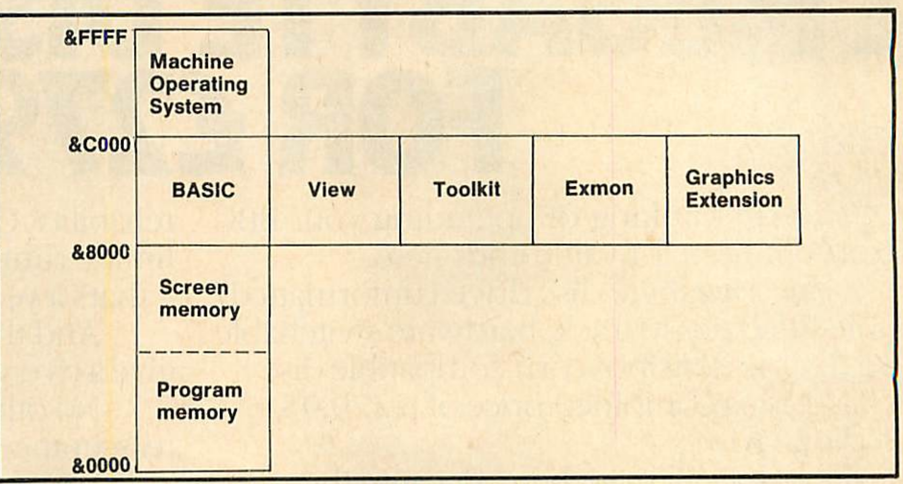
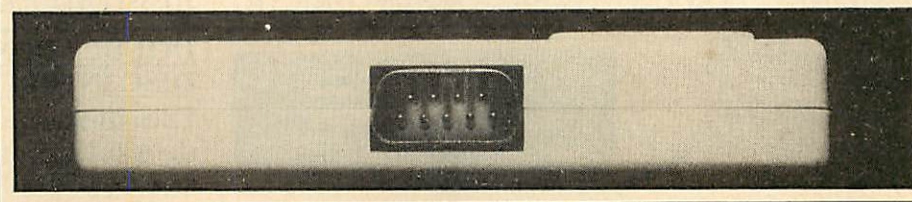


Figure 2. The sideways ROM arrangement – a typical layout



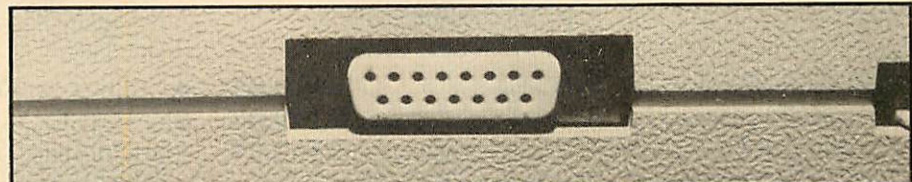
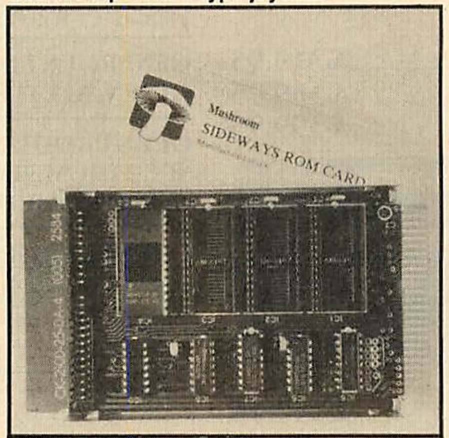


Figure 1. The difference between the ports to handle the standard BBC-type 15-pin joystick and the 9-pin Atari-type joystick



Mushroom Sideways ROM card

Several items of firmware (the term normally applied to software contained within a ROM) are available specifically for the Electron, such as Beebugsoft's *Toolkit* and *Exmon*, and all Acornsoft releases such as *View* and *ViewSheet* will perform to specification on it. Many items marketed specifically for the Beeb will also work correctly on the Elk, Computer Concepts' *Graphics Extension* ROM being a prime example.

In fact any ROM that does not make use of hardware specific to the BBC micro, such as the Teletext mode 7 and the Cathode Ray Tube Controller (CRTC), will stand a good chance of working on an Electron sideways ROM expansion board. Scour the adverts and phone the manufacturer if in doubt.

Printer ports

A printer might well be the first 'serious' add-on you consider. A parallel printer port with a suitable printer will give you access to hard copy of your programs, screen dumps and wordprocessed manuscripts.

Selecting a printer is the next task – look through back issues of *Acorn User* at George Hill's reviews to find the pros and cons of each. Each review includes programs for you to obtain screen dumps of your favourite graphics screens.

Disc interface

Although slow to arrive on the scene, they should soon be here. Acorn's Plus 3 disc interface should be available about now, while Le Box, previewed by Pace at the *Acorn User* show last August, should also be released soon. The Plus 3 is based around unfashionable 3.5in disc drives, while Le Box uses commonplace 5.25in drives. The Acorn system will be referred to as the standard, but there is a large amount of

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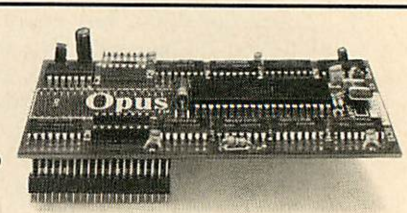
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BBC software already available on 5.25in discs that will run directly on the Elk – the decision is yours.

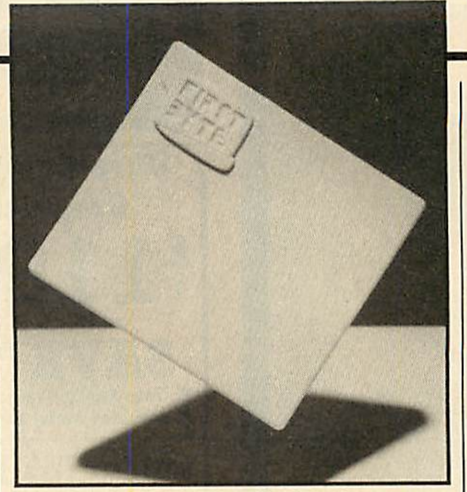
Cartridges

One item promised to BBC micro owners was plug-in cartridge software, which has now materialised but for the Electron. The first Acorn Electron peripheral, the Plus 1, contains two cartridge slots into which games and application firmware can be slotted.

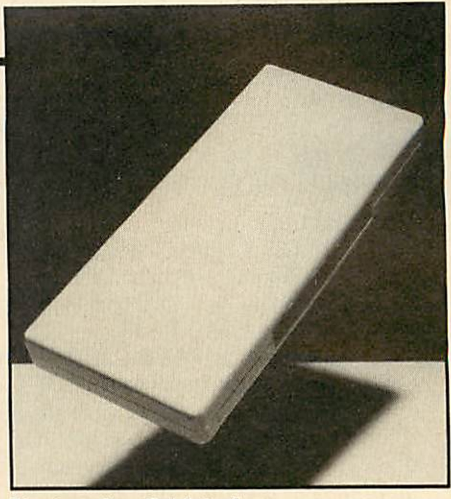
So far the cartridges are produced only by Acorn, and include games favourites such as *Starship Command* and *Snapper*, and the language *Lisp*. An RS423 interface that will allow the Electron to act as a serial link thus opening the door to electronic mail, bulletin boards and modems is planned. All these areas have been covered in *Acorn User* recently.

Some of the range of interfaces available for the Electron are outlined below. The decision as to which, if any, you should buy, is ultimately yours. Before you part with any cash, sit down quietly, decide on your needs, what you can afford and then scour the ads until you find the right item for you. If in doubt contact and question your local dealer or stockist.

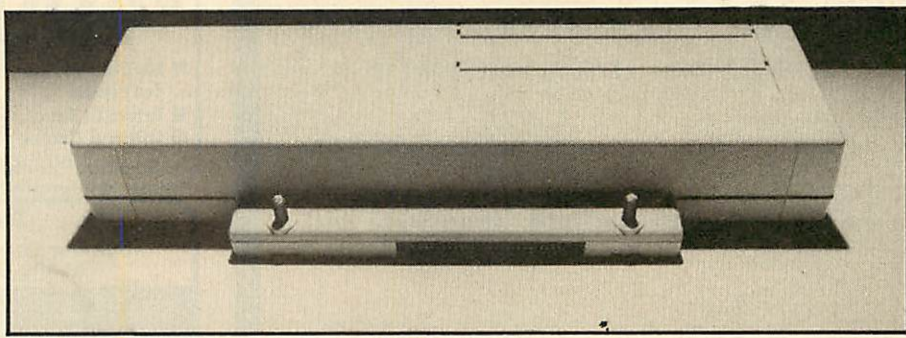
A little preparation now could save a lot of bother later. The choice is yours.



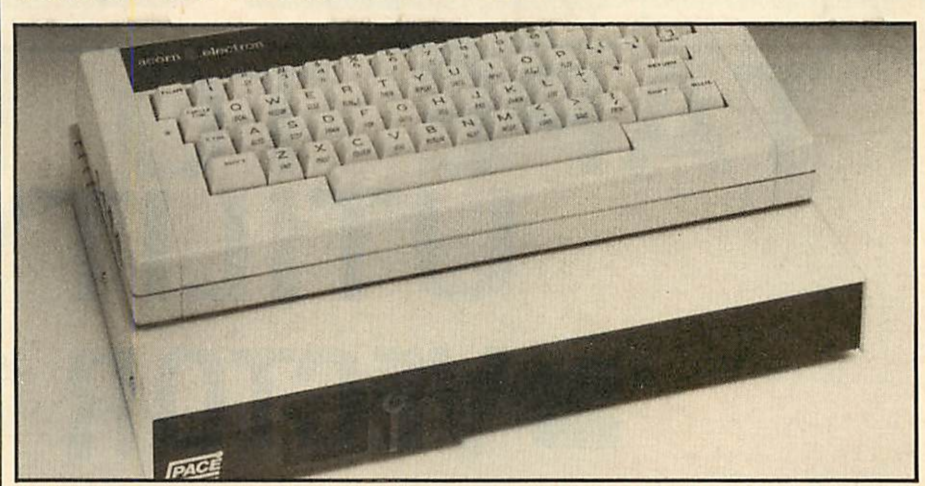
First Byte Switched Joystick Interface



Electron Joystick Interface



Acorn Plus 1 – the first 'all-in-one' unit for the Electron



Le Box from Pace uses 5.25 in disc drives and was previewed at the Acorn User Show

Shop window

Electron Joystick Interface

From: Power Software, 12 Hagley Road, Stourbridge, West Midlands DY8 1PS. Price £24.95 (inc VAT).

This interface is about the size of a large harmonica and fits directly onto the expansion connector. It's of the 9-pin joystick type compatible with all Atari-style joysticks.

On powering-up the unit with the Electron, typing *JOY will present a two choice menu allowing you to select the best use for your particular needs. The first method emulates OSBYTE calls &79, &7A and &81 which are concerned with detecting a specific key, while the second emulates OSBYTE &81 where a time limit is the control parameter, ie you must hit a key within that period. The built-in software thus enables the user to program the joystick to emulate a particular key when pushed or pulled in a certain direction.

First Byte Switched Joystick Interface

From: First Byte Computers, 10 Castlefields, Main Centre, Derby DE1 2PE. Price £19.95 (inc VAT).

A 9-pin Atari-style joystick interface which plugs directly onto the expansion connector, it is about the size of a cigarette packet.

Several software houses, notably Program Power, are producing software compatible with it and non-compatible games can be converted using the games conversion cassette supplied or by writing a short Basic patch as listed on the packaging.

Mushroom Sideways ROM card

From: Mushroom Computers, Aston Road, Cambridge Road, Bedford MK42 0LJ. Price £29.95 (inc VAT).

A useful sideways ROM card capable of housing up to four sideways ROMs. The card is totally encased and a small screwdriver is required to release two fixing screws to allow access under the lid for insertion of the sideways ROMs.

The unit pushes onto the expansion connector which is continued out to the distal side of the unit to facilitate further expansion.

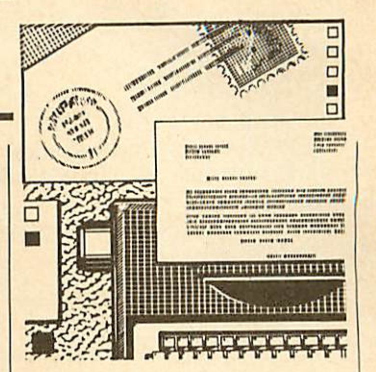
Acorn Plus 1

Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN. Price £59.90 (inc VAT).

The first 'all-in-one' unit for the Electron and reviewed in detail by Bruce Smith in the July 1984 issue of *Acorn User*.

The unit fits and bolts firmly onto the back of the Electron and provides a standard Centronics parallel printer interface, a 15-pin BBC-standard joystick interface and two plug-in cartridge slots. The unit comes supplied with all the necessary software in ROM within the Plus 1 unit.

The Plus 1 forms the rear end of an expanding unit that will open up to accommodate the Plus 3 disc interface and Plus 2 networking system.



Two readers on the turtle trail

Sir, Geoff Nairn ('Floor Show', November) is totally wrong when he excuses the arbitrary distances moved by the Jessop and Valiant turtles by claiming that: 'When used as an educational tool, the absolute distances don't really matter, just as long as 10 Logo units are twice as big as five units . . .'

This is only the case where the turtle is used as a turtle graphics plotter – a replacement for the screen. The turtle is more than this. It is a free-moving physical object which may be controlled interactively by children using Logo. When used thus, it *must* conform to the units conventionally used in the society of which their classroom is a part. How else are they to transfer estimation of spatial dimensions learned in the Logo sessions to the real world?

Geometry is a means of bringing the physical world under mental control and turtle geometry is a natural form of geometry – why insulate it from reality by using arbitrary units? What great merit is there in drawing a line which is incapable of being measured by the child using the ruler in a work box?

The inability of turtles to move in conventional units is inhibiting the development of Logo, for it insulates it from the realities of the classroom and encourages the development of that form of mystique and exclusivity which leads to degenerate formalism.

M P Doyle
Deputy Head
Ravenscliffe Centre

Sir, I would like to point out a slight error in the comparison table accompanying Geoff Nairn's interesting review of buggies and turtles (*Acorn User*, November).

The BBC Buggy is described as not running from Logo. In fact, both Acorn Logo and Open University Logo are being published with the BBC Buggy driver routines as standard. In the case of Open Logo, the Buggy will be capable of drawing arcs, circles and ellipses, and being driven directly from the keyboard, as well as obeying the usual Move/Turn commands.

Ben Newsam
Sheffield

How to print £s

Sir, I own a Shinwa CP80 printer which I use in conjunction with *View* and *ViewSheet* for business purposes. Acorn do not provide a printer driver for the CP80 but the one supplied by Tony Rudkin (*Acorn User* March 1984) works perfectly.

My only problem is that the pound sign does not print out – the pad character replaces it as Tony Rudkin intended. I would appreciate information on how to change Tony Rudkin's program to achieve the pound sign, which is code 129 in the character font of the CP80.

Thank you for an excellent magazine.

Alexander Abel
Dunbartonshire

George Hill replies: The change needed to allow the pound sign to be printed on the CP80 is quite simple.

First, you presumably want the pound sign to appear in place of character 96 (the keyboard pound sign). This means losing your pad character (at least temporarily). Change line 380 to:

380 CMP #96:BNE CharOut: LDA #129::STA &32F2

and the pound sign will appear in its rightful place.

If you want a pad character as well, I'm afraid that a fairly major revision is necessary, as the printer driver takes up every available space in page 4 (&400 to &4FF). The basic idea, to use character 126 ( ) as pad would be first to change line 380 to

380 CMP #126:BNE not_pad:LDA #32:STA &32F0:JMP CharOut

and add

385 .not_pad CMP #96:BNE CharOut:LDA #129:STA &32F0

Then delete one of the routines in its entirety, eg, lines 460 and 670, 680, 690, 700 to 'lose' super/subscripts.

Any other revision will require a major re-think and much tighter programming, or a re-siting of Tony Rudkin's 'buffer' and flags.

Throwing more light on Torch

Sir, I have owned a Torch Z80 second processor for about a year now, and I'm very pleased with it.

I've been using Perfect software, but the moment has now come when I want to buy more software, but where?

Could you tell me if there is a special magazine for Torch computers and/or software, and of any software houses which specialise in Torch software?

Ingrid Brüggemann
Pijnacker
Netherlands

Grahame Perchick replies: I suggest that you contact Sidelight, an independent user group for Torch computers. Members receive a quarterly journal which includes articles on using Perfect software plus news and reviews of software and hardware for the Torch.

The group supplies public domain software for just a small charge to cover the cost of media, copying and postage and packing. Members may obtain discounts on hardware, software and computer supplies. Further details of the group and magazine may be obtained by sending an SAE to Sidelight, 69 The Avenue, Wembley, Middlesex HA9 9PH.

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Spanish solution

THE BBC Micro Club of Tenerife's members are regular *Acorn User* correspondents and competition entrants – here's their president Edmundo Herrero's program to solve our October competition (see page 91 for results). It wasn't one of the first out of the hat, so better luck next time Edmundo!

```
 10 REM Acorn User Oct. 84
 20 REM por Edmundo Herrero
 30 REM BBC Micro Club Tenerife
 40 :
 50 MODE7:TIME=0:DIM C$(49):T%=0
 60 FOR Y%=0 TO 42 STEP 7:READ CC$
 70   FORX%=1 TO 7
 80     C$(X%+Y%)=MID$(CC$,X%,1)
 90     NEXT:NEXT
100 M$="VOTESIR":PROCR(M$,49)
110 T%=(T%-1)*4:T%=T%*T%:S%=TIME/100
120 PRINT''"Solucion   =   ";T%
125 PRINT''"Tiempo     =   ";S%;" seg."
130 END
140 :
150 DEFPROCR(M$,E%):LOCAL N$
160 IF LENM$=1 T%=T%+1:ENDPROC
170 M$=RIGHT$(M$,LEN(M$)-1)
180 N$=LEFT$(M$,1)
190 IF C$(E%-1)=N$ PROCR(M$,E%-1)
200 IF C$(E%-7)=N$ PROCR(M$,E%-7)
210 ENDPROC
220 :
230 DATA"      R"
240 DATA"     RI"
250 DATA"    RIS"
260 DATA"   RISE"
270 DATA"  RISET"
280 DATA" RISETO"
290 DATA"RISETOV"
```

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

Pen-Pal modifications

Sir, In the interests of user-support may I discuss briefly two points in connection with my *Pen-Pal* program, reviewed in the January '85 issue of *Acorn User* (Software for lightpens).

Part of the design brief I set myself was to allow PAGE to be set at &1B00, to allow OLD to rescue the program after BREAK, even for the many education-based systems which have disc and econet interfaces fitted, but still have to work with tapes for reasons of financial restrictions. This forced a trade-off between the routines used and the amount of memory remaining for variable storage, and indeed the fill routine suffers in the compromises that were made.

I have developed a modification to ameliorate this, but it does use some more precious bytes! Any users of *Pen-Pal* who wish to incorporate this routine should send me an SAE for a listing. I can also send details of other recent amendments that have been made as part of the policy of continual development that Watford Electronics encourages me to pursue.

It is true that screens can be interchanged between *Pen-Pal* and *Robin Design* programs, but it should be borne in mind that while *Pen-Pal* is designed to be easily modified for different pens, prospective purchasers of the *Design* program should specify which pen they intend to use when contacting the Educational Software Company.

Ron Owen
5 Keswick Gardens
Wembley, Middlesex HA9 7JH

Vertical tabs on the Juki

Sir, I have a Juki 6100 printer with sheet-feeder attachment and have encountered certain problems concerning its control.

The functions of the printer are controlled by variations of VDU1,27 and, although I can get the simpler functions to work, the vertical tabbing defeats me.

I wish to output my data onto a form 12in square and to print a line of text $\frac{1}{8}$in from the top edge of the paper, then print the first line of data $\frac{1}{8}$in below that. The next thing is to reset the line spacing index so that subsequent lines of data (another 18) are printed $\frac{1}{2}$in apart. Does this mean I have to set top and bottom margins, length of page, form feed, etc at this stage?

I then want to perform a form feed so that the next form arrives in the right place to repeat the process, and achieve some way of counting the number of lines that are output to the printer so that form feeds occur in the right place.

My second problem is that when using a sheet feeder some method of counting lines is required, to enable sub-totals to be carried forward onto the next page which, of course, has been fed to the correct position.

Bob Mita
Coventry

George Hill replies: The vertical tabbing on the Juki is simple but inconvenient. If you wish to set tabs in advance, to respond to the command VDU1,11, you must cause the printer to move to the necessary position, and send ESC – (VDU1,27,1,ASC"–").

The alternative is to set the linefeed at $\frac{1}{8}$in with ESC RS 7 (VDU1,27,1,30,1,7) and send ESC VT 1 for your $\frac{1}{8}$in feed and ESC VT 5,9,13,17 etc for your $\frac{1}{2}$in feeds (VDU1,27,1,11,1,n).

At the end of the page a formfeed (VDU1,12) should send the carriage to the bottom of page, which you should have preset to 12 in by ESC FF 96 (VDU1,27,1,12,1,96 – 12in of $\frac{1}{8}$in lines).

To catch a thief

Sir, In the August *Acorn User* you published an educational program 'Zoo time for micros'.

I have converted this to a complete security system for any conventional home. The computer acts as a VDU, telling the operator who has gone into which room. An alarm is set off and the time is recorded.

I am entering this as one of my projects in the 'O' level exam. This just shows how *Acorn User* can be used and applied in education.

Jagjeet Bhogal
Notts

Latest round-up of games high scores

Aviator	Acornsoft	30,450	**P Hopgood**
Android Attack	Computer Concepts	1,132,985	**Jon Button***
Arcadians	Acornsoft	62,980	**Wyn Hughes**
Battletank	Superior	98,640	**Adrian Foster***
Chukkie Egg	A&F	7,739,440	**Richard Jolliffe***
Crazy Painter	Acornsoft	279,790	**Richard Arundale**
Cybertron Mission	Micro Power	214,540	**Mark Bradshaw**
Fortress	Pace	102,000	**Brian Weatherill**
Frak!	Aardvark	370,700	**D Hughes**
Free Fall	Acornsoft	2,059	**Owain Griffiths**
Hopper	Acornsoft	44,811	**John Durrans**
JCB Digger	Acornsoft	52,000	**Owain Griffiths***
Killer Gorilla	Micro Power	672,550	**O Beman**
Meteors	Acornsoft	73,220	**Robert Hirskyj***
Missile Control	Gemini	39,825	**Keith Butler**
Monsters	Acornsoft	257,060	**Ian Cook***
Moonraider	Micro Power	583,750	**Lindsey Tasker***
Overdrive (BBC)	Superior	102,560	**Daryl McClure***
Overdrive (Electron)	Superior	707,010	**Gerard Mulholland***
Painter	A&F	144,740	**Richard Arundale**
Pengo	Watford	173,000	**Damon Futter***
Planetoids	Acornsoft	639,000	**Stephen Corcoran***
Pole Position	Atari	147,200	**D Hughes**
Rocket Raid	Acornsoft	83,270	**Stephen Corcoran***
Snapper	Acornsoft	280,100	**Mark Davis**
Space Adventure	Virgin	4,680	**Gareth Dykes**
Starship Command	Acornsoft	5,210	**Brian Weatherill**
Zalaga	Aardvark	11,350,200	**Stephen Corcoran***

** Scores unbeaten since December*

Golfball link guidance

Sir, I refer to Sam Burgess' letter in the December issue where he reminisces about the beautiful quality print produced by the IBM golfball machines.

Help may be at hand for any readers who require a cheap printout, possibly to offset litho standards, from their BBC micros. They must, however, be capable of (or know someone who is) sorting out and connecting some 20-odd wires from the IBM to an interface board.

P & R Computers at Salcott Mill, Goldhanger Road, Maldon, Essex (tel 0621-57440) sell an interface, a printer driver for the BBC and the IBM machines themselves. I have been using one with my BBC for some two years now, and am very pleased with the results.

P J Cooper
Essex

Cracking the Centronics code

Sir, This school has a BBC computer, a disc drive and a printer which we were able to purchase at a reasonable price at a sale of bankrupt stock.

Unfortunately, the printer was not accompanied by a handbook and consequently the operation of our Centronic 737 is limited by our lack of the necessary printer codes. Would you know the name, address and telephone number of the Centronics UK agent, or failing that, where we might obtain a copy of a handbook?

K O Williams
Petersfield

The address you want is Centronics, Petersham House, Harrington Road, London SW7 3HA. Tel. 01-581 1011.

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POWERFUL NEW ROMS FOR THE BBC

Never before has there been such a range of powerful but easy to use ROMS for the BBC

ENIGMA DISC IMAGER

Enigma Disc Imager is a 16K ROM which will give you 29 additional powerful disc commands. Some of which are: Enigma will IMAGE ANY DISC, Copy sectors, Repair bad tracks, Read deleted or special sectors, Dumps roms to disc, Loads roms from disc to sideways ram, Moves a programme up or down in memory, Unlocks locked tapes, Locks your tapes, Dumps cassette to disc, Global or selective renaming of directories, Writes deleted or special sectors to disc, Track and sector ID editor facilities, Selective file copier, Formats discs to be 40/80 track compatible (requires an 80 track drive with this command), Special disc editor to cope with protected discs, Special formatter to format discs with non standard tracks, Inserts new files into the catalogue, Enigma makes easy work of editing, copying, repairing, etc., of both standard and non standard discs.

ENIGMA DISC IMAGER IS TUBE COMPATIBLE

ALTRA PROBE

Altra Probe is a 16K ROM which will give you 59 additional powerful machine commands. Some of which are: Altra Probe will list a basic programme straight from file, Formats basic assembler text output, Dissembles, Unpacks, Super Packs, Relocates, Edits memory, Switches off roms, Lists roms, Copies roms to specified address. Calculates free memory, Copies screen text to printer, Lists all specific types of basic variables and values, Graphics dump for Epson or NEC printers, Calculates and details free space on a disc, On board formatter which will automatically format a dual disc, Onboard formatter and verifier. Repairs bad tracks, Disc sector editor, Turns the tube on and off. These are only a few of the commands available from Altra Probe. Altra Probe makes easy work of editing, programme development, etc.
Altra Probe is available in two versions. PROBE 1 and PROBE 2

ALTRA PROBE 2 IS TUBE COMPATIBLE

BASIC ED

Basic Ed, is on 8K ROM which contains 21 additional commands. They are: $ search, List matches, Number matches, Global replace, Selective replace, Bad programme relink, Copy lines from one part of a programme to another, Format a listing, Move, Super pack, Renumber, Table line references, Unpack, Variables X ref, List entire programme, Keyboard immediate mode, Printer on/off, Paged mode on/off, List match lines, Concatenate, Strips rems, spaces etc. Altra Basic Ed. is an essential helpful tool for the Basic / Assembler programmer. Altra Basic Ed. is available in two versions. Basic Ed. 1 and Basic Ed. 2.

ALTRA BASIC ED. 2 IS TUBE COMPATIBLE

FIRST AID 1.1

First Aid 1.1 is an 8K ROM which contains 19 additional commands. They are: Machine code dissembler, Hex and ASCII dump. Sideways rom to ram copier, Function key predefined facilities, Variable table listing, Memory space free calculator, Checksum calculator, Rom lister, String search, Define function keys with strings, Rem and space Stripper, Bad programme fixer, Clear all variables, Clear ram from &0400 to &8000, Machine code monitor, First Aid 1.1 as a language, Lists O.S. calls with their vectors, Lists the first 24 control codes. Altra First Aid 1.1 was designed to assist the Basic / Assembler programmer and the sideways rom user.

PICTURE ANIMATOR

Picture Animator is a mode 7 disc based high quality text and picture editor which lets you compose very sophisticated moving pictures. An ideal tool for the person who wishes to exploit the BBC micros teletex mode. The software is easy to use and your work can be saved to tape or disc.

MUSIC MAESTRO

Music Maestro is a superior and comprehensive disc based sound and music composer. All the sound facilities in the BBC are Utilised. Envelope composition is displayed graphically to assist you in determining the wave form required. Almost any musical instruments voice can be created and reproduced from the BBC. Music Maestro is simple to use and will save your symphony or tune to cassette or disc.







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PICTURE ANIMATOR	*@ £19·00*	____
MUSIC MAESTRO	*@ £19·00*	____
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PROBE 1	*@ £49·00*	____
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F/AID 1.1	*@ £25·00*	____
BASIC-ED	*@ £29·00*	____
BASIC-ED 2	*@ £35·00*	____

I enclose the sum of *TOTAL £* ____
Cheque, P.O. or Credit Card Number ____

Wot, no 8271 manual?

Sir, I read George Hill's article in *Acorn User* (September 1984) with great interest. I quote, 'the 8271 manual ...' What 8271 manual?

I would very much appreciate it if you could tell me where to get one, and whether it is worth having.

R J Pankhurst
London

George Hill replies: I hope I have not raised your hopes. My reference was to the Intel data sheet on the 8271. If you're not into microprocessors and electronics, I'm not sure I would recommend it as light reading! I can't pretend to have read all of it, or understood every word that I did. Richard Harris' article (*Acorn User* October) contains some of the information from the Intel data sheet, and should serve as introductory reading.

Rated the tops

Sir, As a regular reader I was pleased to see in the 'Games of the Year' feature (*Acorn User*, December) that a method of rating was being used – the more acorns, the better the game.

This is a fab idea, and I think that all games reviews would benefit from this method of rating.

John Davis
Bristol

No answers, no sale

Sir, During the last two months I have written ten letters of enquiry to companies whose advertisements regularly appear in *Acorn User*.

The questions asked have usually been quite simple, eg, will a program run on a 32k model A with second 6522 fitted?

Of the four (yes, four!) replies received, two sent literature but made no attempt to answer my questions. Of the two which did bother to give a proper reply, one has now received my order.

The remaining six will receive no further enquiries or orders from me, and I have saved nearly £200 thanks to their disinterest!

So, companies big and small, if a prospective customer writes to you, at least have the courtesy to reply – those who do not will surely not stay in business.

Geoff Smith
Surrey

Bait for the fishermen

Sir, Can any reader help me out with a program that will give a tide-table with calendar/time/high/low tide options? I can work out for myself the time difference from Tower Bridge and GMT, but if these can be incorporated so much the better.

As a fisherman I want to know the best time to dig bait and plan my days fishing well in advance. In return I can supply the programmer with a bucket of the fattest King ragworm and details of local hush-hush hot spots.

Peter Green
Bournemouth

One man's meat

Sir, Have you fallen into the trap that so many computer magazines have?

I have taken *Acorn User* since its inception and have made a point of recommending it to many people as a magazine of the highest quality.

It has become apparent over the last four issues that this is no longer the case. The articles for the average user have become trivial (most occupy a maximum of one page). Remember Joe Telford's original articles?

The plus points are the reviews and educational articles. Please return to the original high standards, or perhaps all that can be said of the BBC micro has been said?

J Bruce
Dunbartonshire

To answer your last question first; no, everything has not been said. But are the articles really trivial? Some may be to you, but what about receiving satellite pictures? December's database? Harry Sinclair's sprite programs? And Joe Telford is still going strong!

We'll be having a reader survey soon, so let us know your opinions in detail then.

Cheap memory expansion for your micro is Kitty's subject



Q I want to expand the memory available on my Beeb, if possible without having to buy an expensive second processor. Could you outline any other options open to me?

I would also like to increase the number of ROM's my Beeb can take – could you give me some advice on this aspect of hardware expansion as well?

David North
Queensland
Australia

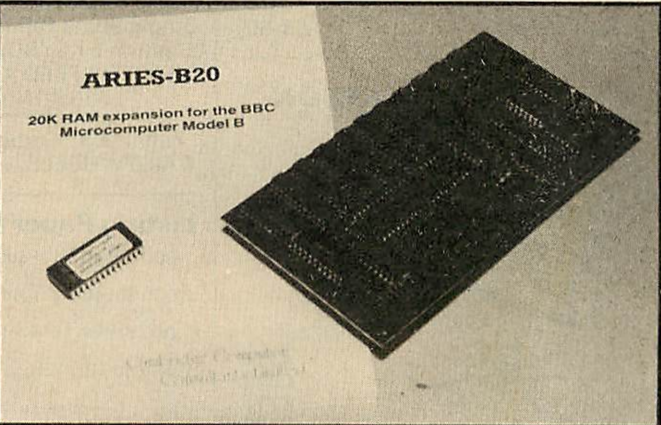
A The 6502 second processor is indeed expensive, and although it supplies an extra 64k of RAM, normally only 48k of this is available to the user once Basic has been loaded in, and other sections of memory claimed. Also much of the Beeb's existing memory becomes redundant and wasted if you are programming in Basic alone.

A useful and cheaper way of expanding your micro's memory is to buy a 20k RAM expansion board, such as those marketed by Cambridge Computer Consultants, Raven and Watford Electronics. These memory expansion boards work by freeing your micro from the need to use the normal user RAM to act as screen memory for displaying graphics and text. This can amount to 20k in the highest resolution screen mode, which will leave you with just 6k if you are using discs. Adding screen replacement memory will free this 20k, allowing very long programs to operate in all graphics modes.

The 20k of RAM supplied by such boards cannot normally be used for programming, and if you are using the lower screen resolution modes then not all of this extra RAM is used. However they do ensure that you always have memory up to &7BFF available for use whatever the mode.

These expansion boards are easy to fit and usually only require the removal of one chip, which is placed onto the board. The expansion board is then plugged into the vacant socket.

A sideways ROM is often included to handle the software side of using such boards. I see that you are using *Wordwise* – early versions of this are not compatible with boards of this type as *Wordwise* pokes the screen directly.



Later versions do work correctly and are marked as being compatible. We have been using the Aries B20 board in the office for some time and have found it very useful.

A comparative review of ROM boards is underway at present and should appear in *Acorn User* in the spring. I suggest you wait and read this for more detailed advice.



Watford Electronics




Dept. AU, 250 High Street, WATFORD, ENGLAND
Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC
ACCESS ORDERS Tel: (0923) 50234

SPECIAL OFFER

BBC Micro (Model B)

Only: £315



BBC MICRO 32K + 32K
(includes extra 32K RAM card already fitted)
Only: **£379**

6502 2nd PROCESSOR	**£175**
Z80 2nd PROCESSOR	**£339**

TORCH Z80 DISC Pack	£695
TORCH Z80 2nd Processor	ONLY £295

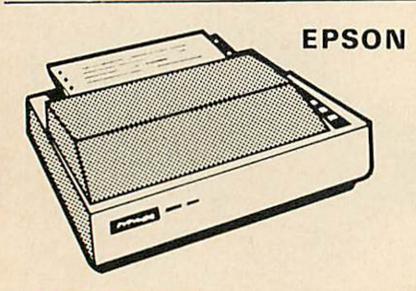
(Securicor carriage on Micros £7)

BBC Micro with ECONET	£375
ECONET Upgrade Kit	£55
File Server Level 1	£85
File Server Level 2	£215
Printer Server EPROM	£41
Terminators (Pair)	£60
Clock with PSU	£35
10 Station Lead Set	£25
ECONET User Guide and Cable	£10
TELETEXT Adaptor	£195
Acorn Bitstick	£328

Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies while not in use. **£3.50**

EPSON



- EPSON RX80 Printer **£209**
- EPSON RX80 F/T Printer **£219**
- EPSON FX80 Printer **£316**
- EPSON FX 100 Printer **£429**
- SEIKOSHA GP100A **£122**
- Centronics PRINTER CABLE for all the above printers to interface with the BBC Micro. **£7**

(Securicor carriage charge on printers £7)

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£35	RS232 + 2K Buffer	£59
IEEE 488	£65	2K Parallel	£58

Type	Ribbons	Dust Covers
MX80FT	£4.75	
MX100/FX100	£10.00	£5.25
FX80	£4.75	£4.95
RX80	£4.75	£4.50
GP80	£4.50	–
GP100	£4.95	£3.95
GP250	£5.95	£3.95
GP700	£18.50	
KAGA KP810	£5.95	£4.75
CANON PW1080	£5.95	£4.75
MICROVITEC MONITORS	–	£5.50

4 COLOUR PLOTTER PRINTER

How often have you wished you had a colour plotter for your computer, but have been put off by their high cost? Well, Watford Electronics can now supply you with a high quality, low cost plotter with Centronics interface. The SCP-800 printer/plotter facilitates plotting and printing in four colours on paper up to A4 size, using easily replaced pens. It can operate in a text mode, performing like an ordinary printer capable of speeds up to 12 CPS with a maximum of 160 characters per line on A4 paper. In graphics mode it offers full plotting facilities including drawing, moving, scaling of text, rotation and drawing of axes.

(Write in for a sample printout). For a COLORDUMP ROM see page 4 of our advert. **Only £175** (£5 carr.)

BROTHER HR-15

DAISY-WHEEL PRINTER

Brother HR15 is a high-quality daisy-wheel ideal for a budget printer for serious use. Notable features of this printer include a 3k buffer, 18cps (max), bi-directional printing, proportional spacing, Centronics or RS232 interfaces as standard, optional sheet feeder and an optional keyboard.

ONLY **£329** (carr. £7)

Single Sheet Feeder	**£195**
Electronic KEYBOARD	**£135**
TRACTOR FEED Attachment	**£90**

RIBBON CARTRIDGES:

Fabric **£3;** Carbon **£3;** Multistrike **£6**
DAISYWHEELS (various typefaces) **£18**

Listing Paper (Plain)

1,000 Sheets 9½" Fanfold Paper	£7
2,000 Sheets 9½" Fanfold Paper	£13
1,000 Sheets 15" Fanfold Paper	£9
Teleprinter Roll (Econo paper)	£4

Carriage on 1,000 Sheets £1.50

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90×36mm	£5.50
1,000 90×49mm	£7.75
1,000 102×36mm	£6.25

Carriage on Printer Paper or Labels £1.50
Carriage on 1,000 Labels £1.00

All prices exclude VAT

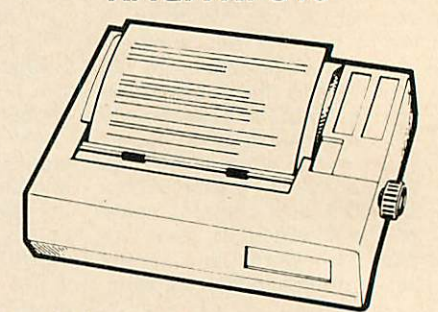
SPECIAL OFFER

HITACHI EPROMs for Sideways ROMs
2764-250nS **£4.50**
27128-250nS **£13.00**
RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards
6116LP (2K) **£3.50**
6264LP (8K) **£15.00**

FIRMWARE

ACORN 1.2 DNFS ROM	£15.00
ACORN 1.2 OS ROM	£10.00
ACORN BASIC 2	£30.00

KAGA KP810



What do the press say:-
"At £269 this is an unbeatable product for what it has to offer". – Educational Computing.
"Offers excellent value for money". – Electronics & Computing.
This new Japanese printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, Proper adjustable tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£242** (£7 carr.)

RS232 interface + 2K buffer to connect to other micros. **£89**

KAGA KP910 PRINTER

Very similar to the KP810 but with 17" carriage for really wide print. Gives 156 columns of normal print or 256 columns in condensed mode. This printer is ideal for printing out spreadsheets and can also be used for correspondence in NLQ mode.

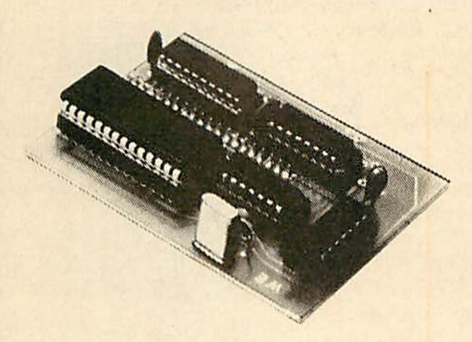
ONLY **£339** (£7 carr.)

PRINTER LEAD

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	£7
Extra long (5 feet long)	£9

DOUBLE DENSITY
DISC INTERFACE



SIMPLE but SOPHISTICATED

We are proud to bring to you the Watford Electronics Double Density Board for the BBC Micro.
The DDFS supplied is a new version of the popular Watford Electronics DFS re-written to make full use of the capabilities of the new double density controller.

- Increases storage capacity of your Disc Drives by the maximum physically possible, 80% !!!
- Our system will use the whole of an 80 track drive. Inferior systems do not allow files longer than &3FFFF bytes, but with our system files can be as long as one disc side.
- Discs may be created in either single or double density format with the built in formatter and in single density mode are fully compatible with normal Acorn format discs.
- The density of the disc you put in is automatically sensed by the system and you are informed of the density in the catalogue display.
- The double density system is of course faster than single density.

The Watford Electronics DDFS implements an extremely comprehensive 8271 emulator so that commands passed through OSWORD & 7F are correctly interpreted. Other manufacturers thought that read and write sector alone were sufficient – we decided to implement every command of the 8271 that was physically possible. We have allowed the use of all the special registers including bad tracks, allowed access to deleted data etc., etc. The emulator itself takes up around 1K of compactly written machine code. We reckon it will run many of the protected discs now available. Gain all the advantages of the WE DFS together with much increased storage and compatibility with many existing protected discs.
(please write-in for full technical specifications)

Complete Unit incl. DDFS ROM **£85**
DDFS Manual **£6.95** (no VAT)
We will exchange your existing Single Density Interface for our DDFS Unit for **£49**
(Carriage £1.50)

3M - 5¼" DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick, disc labels and write protect tabs.

DON'T SETTLE FOR LESS, BUY THE BEST

● 10	S/S D/D	40 Track Diskettes	**£14**
● 10	D/S D/D	40 Track Diskettes	**£18**
● 10	S/S D/D	96 Track Diskettes	**£22**
● 10	D/S D/D	96 Track Diskettes	**£24**

SPECIAL CALCULATOR OFFER

We are offering a quality slimline pocket calculator, ABSOLUTELY FREE with every box of 10 diskettes purchased during this month.
(Offer valid while present stocks last).

THE ULTIMATE DFS FOR BBC MICRO

Watford are proud to be able to supply both SINGLE and DOUBLE DENSITY versions of their highly acclaimed Acorn compatible DISC FILING SYSTEM.
What do the independent press say?

"Good value for money" – Beebug
"A very worthwhile package" – The Micro User
"You'll be buying a very powerful package" – Personal Computer News
"Superior DFS; Excellent disc sector editor" – Computer Answers

Without a doubt the most sophisticated DFS software yet written for the BBC microcomputer. This powerful DFS is fully compatible with the ACORN DFS, yet has much increased power due to the additions, carefully designed to make life easier in normal use. It consists of 16K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

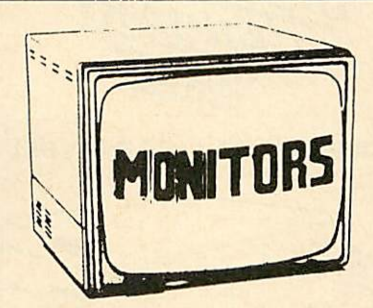
- DFS (Disc Filing System) ROM only **£26**
- Complete Disc Interface Kit Incl. DFS ROM & fitting instructions **£115**
- Acorn's DFS Kit complete **£99**
- ACORN's new 1.2 DNFS ROM only **£15**
- Disc Filing System Manual (Comprehensive) (no VAT) **£6.95**

P.S.
We will exchange your existing ACORN DFS for Watford's highly sophisticated DFS ROM for **Only: £18**

Watford's DFS is exclusively available from Watford Electronics. We DO NOT retail this product through dealers. Every ROM carries a printed label with our LOGO and a serial number.

THE FEATURES OF WATFORD'S SINGLE & DOUBLE DENSITY DFS.

- The system can either use the ACORN standard 31 files per disc side or DOUBLE THE NUMBER to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.
- A FORMATTING PROGRAM is built in, permitting formatting to 35, 40, 80 track formats with either 31 or 62 files. Since the formatter is built into the DFS it can be used without affecting whatever program you are using.
- A DISC VERIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.
- A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is extremely useful for recovering accidently deleted files and can save weeks of work.
- A double step mode allows the user of 80 TRACK DRIVES TO READ AND WRITE BOTH 40 & 80 TRACK DISCS. This mode is software selected for each drive individually, thus allowing a 40 track disc to be copied onto an 80 track one very easily. THIS ELIMINATES THE NEED FOR EXPENSIVE SWITCHABLE DRIVES.
- A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once. Automatic increment function SAVES successively numbered versions of a file, every time SAVE is used.
- When using LOAD, CHAIN etc., it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.
- Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1100, switch off the disc system and then move the file to its correct load address, thus saving a lot of complicated programming. This command can be used to load files upto 27.75K long.
- An advanced COPY command is included which will prompt the user, requesting whether to copy each file.
- RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command, much as you would on a mainframe!
- OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT will create before you waste time compacting and possibly losing your program.
- 2K of RAM can be reclaimed from the DFS by setting "PAGE" to &1100.
- The DFS is fully compatible with TELETEXT, TORCH and both ACORN Second Processor systems. Discs prepared with the Watford DFS can be used under ACORN DFS without any changes, so there are no problems in exchanging software with ACORN DFS users.
- A comprehensive and clearly written manual is available seperately and this explains both the standard ACORN functions and the extra WATFORD features.



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

MICROVITEC

- 1431 – Medium resolution as used on the BBC television computer programme **£165**
- 1451 – High resolution, suitable for word processing in mode 0 .... **£250**
- 1441 – High res, exceeds the capabilities of the BBC micro **£385**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£305**
- Dust Cover for Microvitecs **£5.50**

All Microvitec Monitors are 14" RGB in their distinctive right angle sturdy metal case or the new beige plastic case. They are supplied complete with connecting lead to the BBC and a 3pin mains plug.

KAGA

- KAGA Vision 3 Super High resolution, Colour **£310**

Kaga Monitors are 12" RGB colour units housed in an attractive beige plastic cabinet. They all have as standard, a genuine etched anti-glare screen.

ZENITH

12" Ultra high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics .... ONLY **£68**

LEADS
BNC Lead for Zenith or Philips **£3**
RGB lead for KAGA **£5**
N.B. Carriage on Monitors **£7** (securicor)

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply

Continued ▶

everything you need to get a BBC micro running as a word processor. Please call in for a demonstration.

EXAMPLE PACKAGE
BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 200k Teac drives in beige, Zenith 12" Hi resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 · 3M disc, 500 sheets fan fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

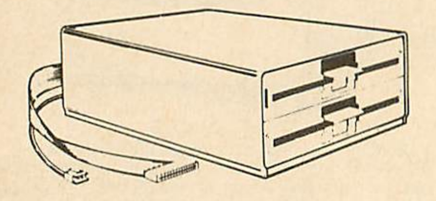
NEW LOW PRICE
Only £1,119



ACCESS HOT LINE (0923 50234)
24 Hours



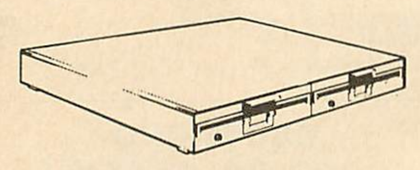
(NEW SLIM-LINE DRIVES)



(DRIVES Cased with Cables. No PSU. Connects directly to the BBC's power socket.)

- **CLS 100** Single, TEC Single sided 40 track 100K, 5¼" Disc Drive **£89**
- **CLS200** Single EPSON Drive, Double sided 40 track, 200K, 5¼" **£99**
- **CLS400** Single, Mitsubishi/Epson Double sided 80 track 400K, 5¼" Disc Drive **£126**
- **CLS400S** Single, Mitsubishi/Epson Double sided 40/80 track Switchable, 400K, 5¼" Disc Drive **£145**
- **CLD200** TEC Single sided 40 track 200K twin 5¼" Drives **£165**
- **CLD400** Epson, Double sided 40 track 400K, 5¼" TWIN Drives **£199**
- **CLD800** Mitsubishi/Epson Double sided 80 track 800K, 5¼" TWIN Drives **£235**
- **CLD800S** Mitsubishi/Epson Double sided 40/80 track switchable, 800K, Drives **£299**

(CUMANA) DRIVES CASED WITH PSU & CABLES



- **CS100** TEC Single sided 40 track 100K 5¼" Single Disc Drive **£119**
- **CS200** Epson Double sided 40 track 200K 5¼" Single Disc Drive **£149**
- **CS400** Mitsubishi/Epson Double sided 80 track 400K 5¼" Single Drive **£165**
- **CS400S** Mitsubishi/Epson Double sided 80 track 400K 5¼" Single Drive **£179**
- **CD200** TEC Single sided 40 track 200K 5¼" TWIN Disc Drives **£236**
- **CD400** EPSON Double sided 40 track 400K 5¼" TWIN Disc Drives **£280**
- **CD800** Mitsubishi Double sided 80 track 800K 5¼" TWIN Drives **£339**
- **CD800S** Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives **£350**
- SPARE DRIVE CABLES, SINGLE **£6**; DUAL **£8**
- DFS Manual (comprehensive) **£7** (No VAT)

(Carriage on Disc Drives £7 securicor)

P.S.
- You do not require a formatting Disc nor the expensive 40/80 track switchable Drives when using Watford's sophisticated Disc Filing System which has this facility as one of the many facilities incorporated in it as standard.

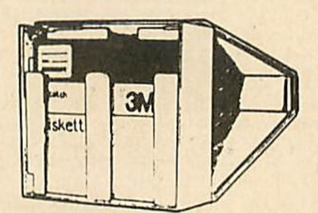
Cont.

- MITSUBISHI & EPSON Slimline 400K Disc Drives that we supply are Double sided Double Density, 1 Megabyte unformatted, (With BBC Micro 400K after formatting). When used in conjunction with our Double Density Interface, you obtain 725K formatted. Track density is 96 TPI, track to track access time is 3mSec. These drives are very fast, quiet and efficient. We strongly recommend them.
- Extensive test carried out in our workshop has proved that the BBC Micro's own switchmode power supply is capable of driving 2 disc drives and a host of Sideways ROMs without undue heating. We recommend our CLS & CLD range of Disc Drives which will save you considerable expense without sacrificing performance.
- Please send an SAE, for further technical specification on our Disc Drives.

MYSTERIES OF DISC DRIVES

Do you find cassettes slow and unreliable, but hesitate when considering discs because you don't understand the terminology? If so, then this is the ideal book for you.
£5.95 (No VAT)

PLASTIC LIBRARY CASES



for Disc Storage 5¼" (holds 10) **£1.80**

DUST COVERS

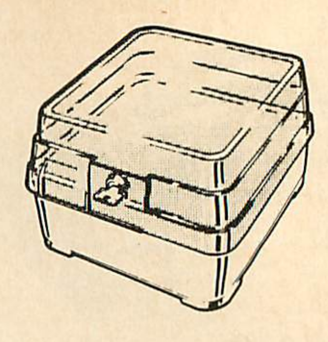
(For our Disc Drives)

Single (without PSU)	**£3.20**
Twin (without PSU)	**£3.85**
Single (with PSU)	**£3.25**
Twin (with PSU)	**£3.90**
Twin (side by side with PSU)	**£3.95**

DISC ALBUMS

Attractively finished in beige leather-look vinyl, these conveniently store up to 20 discs. Each disc can easily be seen through the clear view pockets. **£4.25**

LOCKABLE DISK STORAGE UNITS



Strong plastic cases that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 holds upto 40 discs **£13**

M85 holds upto 95 discs **£17**

FLOPPY HEAD CLEANER KIT

The heads in a floppy disc drive are precision made and very sensitive to dirt. Drive manufacturers recommend that you clean the heads approximately once a week. Unless your home or office is dust free one of these kits is a very sensible precaution against losing valuable data. A dirty head can destroy many disks before you realise the trouble. Very simple to use. ...... Only **£12**

EPSON DUMP ROM

This screen dump ROM is specifically designed for use with the Epson RX/FX printers and the Kaga KP810. It is extremely simple to use as there is only one command to remember. It will accurately dump any screen mode using multiple tones as required. Mode 7 is fully supported giving teletext graphics, double height etc. For those who like to keep life simple this EPROM is only ...... **£20.**

EPSON FX/RX NEAR LETTER QUALITY PRINT ROM

Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set.

Standard 'pica size'
Proportional spacing
Enlarged
Underlined
Normal type
The NLQ ROM is incredibly easy to fit and use. Supplied complete with Manual.

Only: £20



THE EPSON FX/KAGA PRINTER COMMANDS REVEALED

for the BBC Microcomputer
(The only Printer Book for the Epson FX-80 compatible printers).

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements *back in your face.*

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

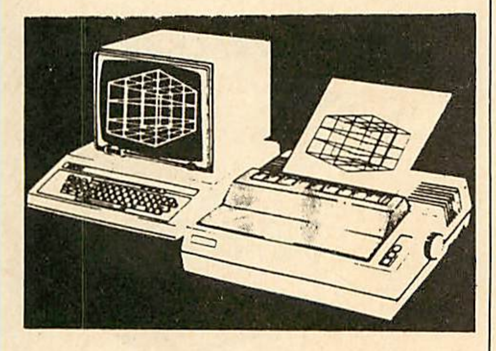
This book is superb value at only
£5.95 (Book – No VAT)

FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£32**

TINY PASCAL for BBC Micro £54

DUMPOUT 3
NOW WITH EXTRA FEATURES!



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump routines:

*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are many optional parameters but you need only specify the parameters you wish to change.

- V <scale>, H <scale> – These 2 byte numbers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs, scale works the same in all modes inc. mode 7.
- R <0-3> – Print dump rotated by 0, 90, 180, 270 degrees.
- I <indent> – Set gap from left edge of paper.
- X <min><max>, Y <min><max> – Selects screen area, by default the whole graphics window is dumped.
- P – Dump shows physical colour values.
- G – Grey scale reproduction, dumps otherwise use a negative scale (white prints darkest).
- T Two tone dump for maximum resolution.
- M <mask> – 8 bit colour mask.
- E – Contrast expansion to make mode 7 text and separated graphics stand out clearly from the background.
- C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.
- K – Key-triggered dump. The dump does not commence immediately, but can be triggered off later by pressing <SHIFT><0> or <CTRL><ESCAPE>.
- S – Switch-triggered dump. As K, but the trigger is an external switch (not supplied) connected to the user port. The S option can still work with games that corrupt RAM page D.

*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.

*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. Note that GIMAGE and GWINDOW work fully in mode 7.

Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.

Price including comprehensive manual
£22

COLORDUMP ROM

To accompany the marvellous SCP-800 Colour Printer Plotter, Watford are proud to announce a specially written ROM for this UNIT called the COLORDUMP ROM.

This superb new ROM has all the standard DUMPOUT 3 features, including window setting and the new dump-trigger options etc, PLUS plot mimicking. The graphics dump command is now *CIMAGE (so you can have DUMPOUT and COLORDUMP in use together). Dumps having up to 8 colours are possible, alternate-line colour mixing being used to produce approximate magenta, cyan and yellow. *PLOTON All graphics plotting done on the screen using the PLOT and DRAW commands is automatically duplicated on the plotter. Point, line, dotted-line, fine-fill, line-blanking, and triangle fill are all mimicked. With optional parameters:

- H<scale>, V<scale> – Giving fine control of plot scaling.
- I<indent> – To set gap from edge of paper.

*PLOTOFF Turns off plot-mimicking. Selecting shift-lock on is an alternative method of temporarily stopping mimic.

For use with: Seikosha/Sakata SCP800 8 inch plotters and MCP40/CGP115/ Oric 4 inch plotters.

PRICE: Only £22

FX80 PRINTER DRIVER

Watford's own Sophisticated VIEW Printer Driver for FX80

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£6**

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £7

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 and converted typewriters EX43/44 & 55.

Only: £7

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

BEEB PRINTER ROM



"Makes Printing Childs Play"

This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

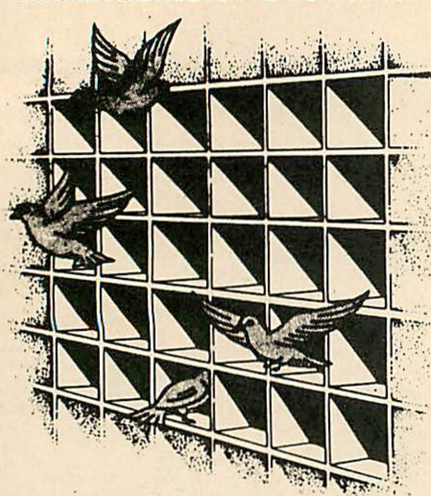
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

Continued ▶

TWO DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely. Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are –, +, *, /, +–999999 9999.9999 and compare facilities =, >,<>>=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based DATABASE Management System
Special Offer: **£99**

PEN PAL–VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Faciiities included are:
- Pixel, Line and Character definition
- Free hand drawing
- All Colours
- Fill, Refill and stripes
- User defined "Brush strokes" plus character definer
- Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
- Move design/character to any screen position
- Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.

This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices
TAPE .... **£11**; DISC **£12**

LIGHT PEN



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see eleswhere in this ad).

Only **£20**

(For software on disc please add £2)

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money.

.... Price **£10**

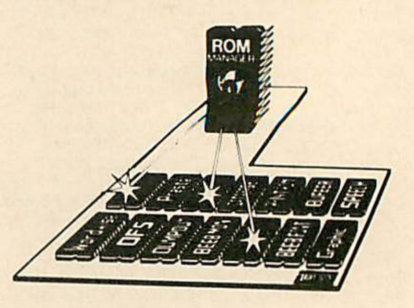
(Please specify 40 or 80 track discs)

ADE

'Systems' complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

ROM MANAGER

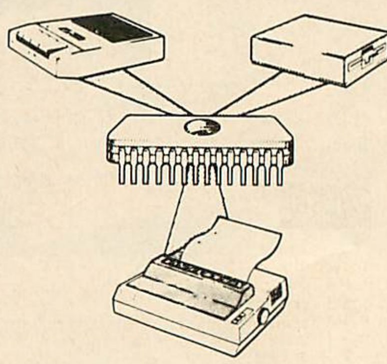


'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**

BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:
★ 4K or 16K buffer for parallel printer.
★ Dumps selection of Disc files to Tape.
★ Makes backup copies of tapes on to tape and disc.
★ Displays contents of paged ROMs on screen.
★ Menu display of ROM filing system contents on Shift-Break.
★ Comprehensive manual.
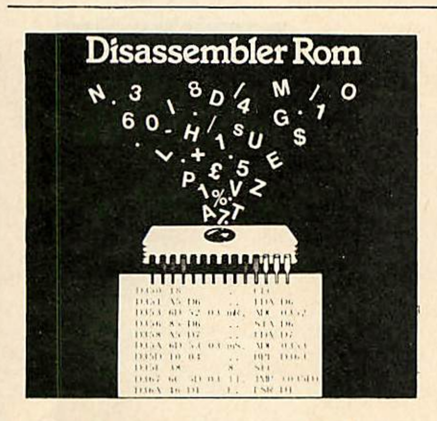
Only £22



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£22

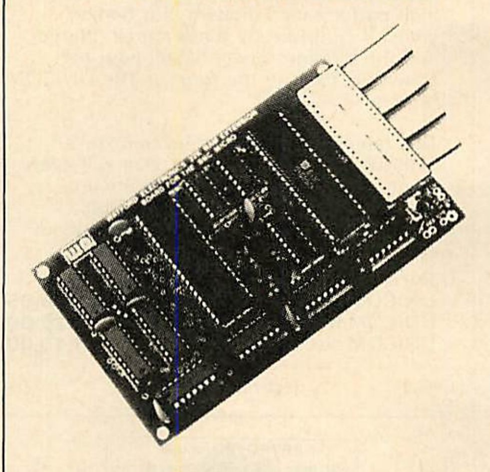


Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

32K RAM

EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. It simply plugs into your micro's 6502 processor socket. (No soldering required). This compact board which fits inside the computer doesn't just give you 16k or even 30k of extra RAM, but a massive **32K !!!**
There are many more useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE, etc.

- The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER BUFFER for SERIAL or PARALLEL printers, sound channels, RS423, Keyboard or Speech Synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it. e.g. *FX15,21,138, 145, ADVAL (–no.) etc.

- This board is the ideal complement to any word processing system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +)

- Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion board, double density DFS Units and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can be either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.

- The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many *HELP messages.

JANUARY SALE

Only: £60 (carr. £1)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

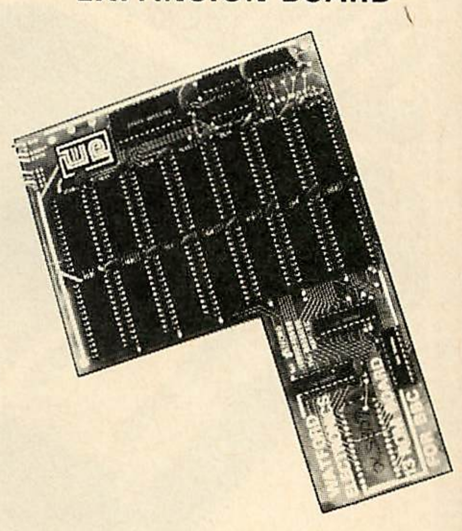
BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

JANUARY SALE PRICE
ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.
Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead). Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

SPECIAL OFFER: £28 (carr. £1)

Continued ▶

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
TERMI	£27
COMMUNICATOR	£58

Wordwise

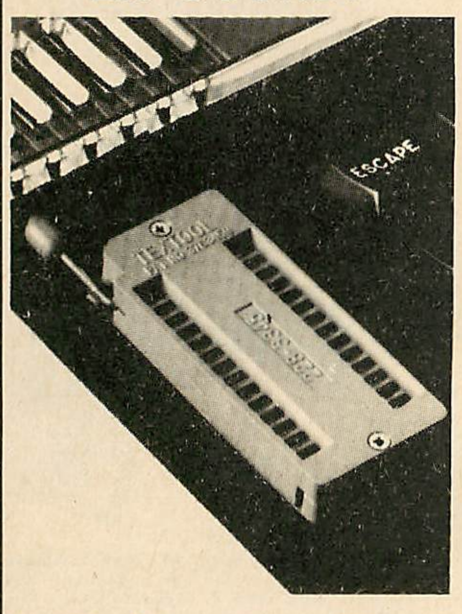
Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

WORDWISE PLUS

Now available from stock **£49**

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

- Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.
- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£16** (£1 carr.)

The UNICOM Modem

Are you thinking of purchasing a low cost high performance modem, but finding yourself confused by the features offered and the different prices? Well now the answer is here, in the form of The UNICOM Modem!

This fabulous modem offers the packed with all the features most Users will ever want (plus many more!) The software includes some of the most powerful, flexible and easy to use modem software ever written for a micro.

Price:

UNICOM MODEM	£49.95
UNICOM ROM Software	£20.00
UNICOM disc Software	£10.00

(Carriage £2.50)

APPRO[illegible] for use with teleco[illegible] systems run by Briti[illegible] munications in accorda[illegible] conditions in the in[illegible]s for use.

MODEM 84

PRESTEL TERMINAL

For the BBC Microcomputer



The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM. Please write-in for full technical literature.

PRICES

MODEM 84 (with Lead & Manual)	£68
MODEM 84 complete with PRESTEL SOFTWARE ROM, Lead and manuals	£82
PRESTEL SOFTWARE ROM + Manual	£20
USER to USER 1200 BAUD SOFTWARE ROM	£18

(At these incredibly low prices for such a sophisticated BT Approved Prestel Terminal, Modem 84 has to be the best buy around)

(Carriage on Modem £2)

Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes comprehensive manuals) **£119**



ELECTRONIC DESK DIARY for the BBC *Micro*

Watford's Electronic Desk Diary and Clock is a complete Diary, Alarm Clock and a Calendar. The attractively finished desk top unit comes complete with power supply, its own on-board RAM and software in an 8K ROM.

Features include:

- A complete desk diary, planner, calendar and full feature alarm clock for the BBC microcomputer.
- Software supplied on ROM for instant access.
- Over 100 events programmable into the minimum RAM.
- Events may be assigned many levels of priority.
- Diary may be opened at any date.
- Events may cause programmes to be executed at any predetermined time and date.
- Events may repeat yearly, monthly, weekly or daily.
- BBC will be powered up automatically to execute important events.
- 2K of CMOS RAM provided as standard for storing events.
- RAM expandable to 32K.
- No BBC's workspace RAM required.
- Printout of calendar for any month and year specified (between the years 1900 and 2100).
- Printout of current time and date on request.
- Easy access of time and date from Basic and other programmes, (including M/C programmes).
- Internal power supply (no power taken from BBC).
- Interfaces to 1MHz bus.
- Battery backup optional.
- Diary compatible with all 'legal' BBC add ons and ROMs.

Watford's Desk Diary Unit is a must for every serious user of BBC Micro.

Introductory Price: Only **£75**

(Carriage £2.50)

Versatile BEEB SPEECH SYNTHESISER Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.

HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

SPECIAL OFFER £35

BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
36 Challenging Games for BBC	£5.95
40 Educational Programs for BBC	£5.95
100 Programs for BBC Micro	£6.95
Cassette version of above	£10.00
6502 Application Book	£11.95
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£14.25
6502 Machine Code for Beginners	£5.95
6502 Machine code for Humans	£7.95
6502 Software Design	£10.50
A young persons guide to BBC Basic	£4.50
A beginners guide to LISP	£10.95
Advanced Machine Code Technique for BBC	£7.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
BBC Basic	£7.95
Assembly Lang. Prog. on BBC	£7.40
BBC BASIC	£5.95
BBC Computer Magic	£5.50
BBC DIY Robotics & Sensors	£6.95
BBC Forth	£7.50
BBC Lisp	£7.50
BBC Micro An Expert Guide	£6.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Assembly Lang. Prog.	£7.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
Basic Programming on BBC Micro	£5.95
CP/M The software BUS	£8.95
CP/M Users Guide	£13.95
Creating Adventure Programs on BBC Micros	£6.95
Creative Graphics Cassette (Acornsoft). Has 36 graphics programs	£8.95
Creative graphics on BBC Micro	£7.50
Complete Programmer for BBC	£5.95
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
DIY Robotics & Sensors with BBC	£6.95
Exploring FORTH	£6.95
Further Prog. for BBC Micro	£5.95
Forth Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games on your BBC Micro	£2.95
Games BBC Computer Can Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Graphs and Charts (Cassette)	£7.50
Introducing the BBC Micro	£5.95
Introduction to FORTH	£9.30
Interfacing projects for the BBC Micro	£6.95
Introducing LOGO	£5.95
Let your BBC teach u to program	£6.45
LISP	£9.25
Logo Programming	£8.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering CP/M	£13.65
Programming the 6502	£11.95
Programming the Z80	£14.25
PASCAL	£9.25
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Epson FX/KAGA PRINTER Commands REVEALED	**£5.95**
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Using 6502 Ass. Language	£14.50
Wordstar & CP/M made easy	£6.95

Watford brings you

THE AMX MOUSE

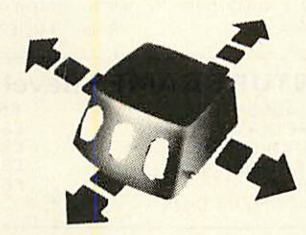
'The program is simplicity itself and the user manual is virtually redundant' . . . Micro User Jan. 85.

Bring into your home or office the last word in user friendly input devices for the Beeb. The AMX MOUSE that won the hearts and the minds of thousands of visitors at the Show has arrived at Watford Electronics at a very special price!

Using simple Icons, and small movements of the mouse on a work surface, you can select any one of the functions from the pull down menus. The mouse will operate from within Wordwise, View and many other software packages. The three buttons built in to the mouse are user programmable for many extra functions.

The package consists of the mouse, the advanced controlling software in ROM and a disc containing the Icon designer and the AMS ART software (see diagrams).

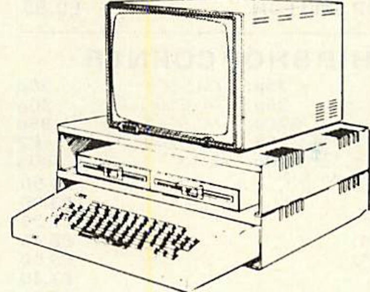
To summarise this superb product a comment passed by a very senior authority on BBC micro at the last Micro User Show was, 'My only criticism of the product is that, IT'S TOO CHEAP!'



OUR SPECIAL INTRODUCTORY OFFER PRICE

ONLY: £68.50

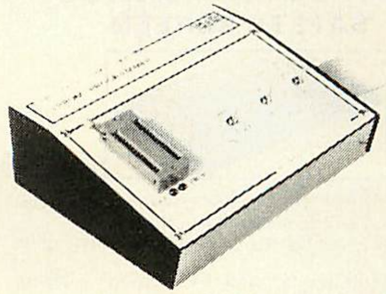
PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH .... **£11** (carr. £1.50)
DOUBLE BBC PLINTH .... **£20** (carr. £2.00)
PRINTER PLINTH .... **£10** (carr. £1.50)

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69
(£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

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The Voltmace system provides full facilities for connecting the Delta 14 handset.
Delta 14 handset – On its own makes a high quality centre sprung analogue joystick with fire buttons **£12.50**
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Tape **£5.10** Disc **£7.95**

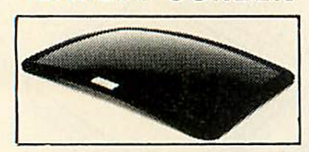
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These are standard analogue type with a fire button on each joystick. Twin joysticks go to a single moulded plug, long leads provided.

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Continued ▶

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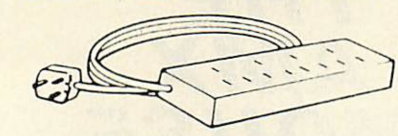
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BBC MICRO VIDEO DIGITISER
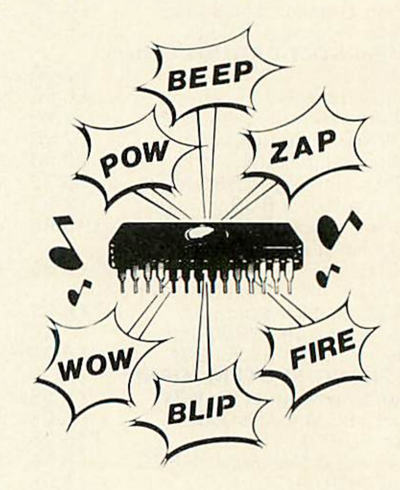
Using any video generator with a composite video output (e.g. a standard video camera or video recorder) the Beeb Video Digitiser will convert any image into a graphics screen of the BBC micro in modes 0, 1 or 2. The video source may be a camera or video recorder.

Once an image has been captured, it can be compressed and stored to disc, printed on an Epson or similar compatible printer, analysed for scientific and educational use, directly used to generate graphics or converted to other formats, e.g. slow scan television.

The output of the digitiser exactly matches the graphics capability in each mode, with up to 8 grey levels in mode 2. The unit connects into the user port, automatically scanning a complete picture in 1.6 seconds. The software to control the digitiser is supplied in EPROM and can be easily accessed using star commands directly from BASIC.

The package is designed to allow easy input of complex screens and then give full access of the data to the user. The special printer dump routine included in the driving software is especially designed to produce a fast and correctly proportioned picture with reduced contouring. Detailed examples of how to drive this unit from BASIC or other languages are provided in the manual.

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Now for the sound fanatic or those of you who want to drive the pet crazy, Watford Electronics offers you this unique piece of firmware called the Envelope ROM. It contains a wide range of sound effects, in fact enough to ZAP, BANG, SQUEAK and EXPLODE your way through a whole galaxy of games. Some of the more unusual effects include ZIT, TRIMPHONE, SNAPPER, TARDIS, and a whole host of explosions, gun fire, winning and losing sounds and many other effects to aid the progress of a game. A choice of over 65 sounds.
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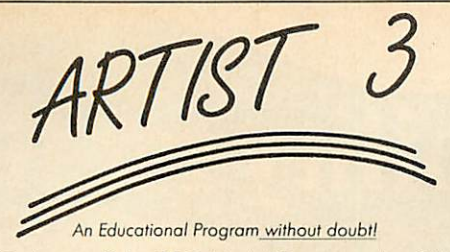
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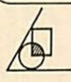
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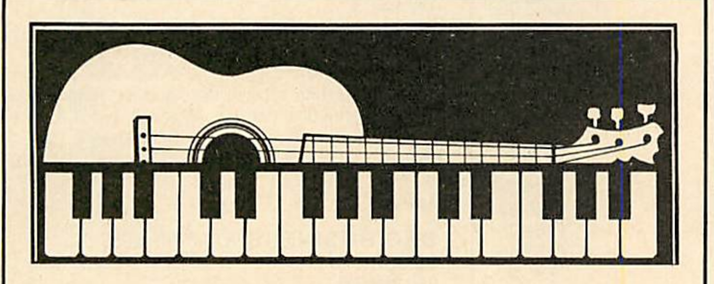
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Software	£19.95

Telemod 3

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BBC 4

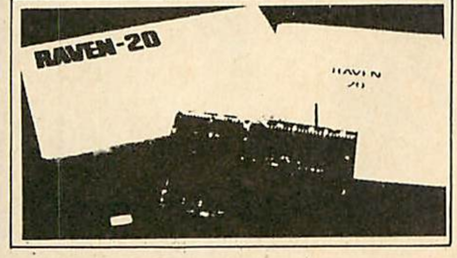
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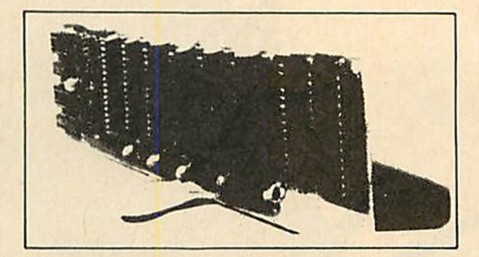
RAVEN-20 BOARD

The RAVEN-20 is a 20K RAM EXPANSION for the BBC Micro, Model B, fitted with O.S. 1.2.

This specially designed product plugs in to the CPU socket of your micro (centre socket of the 3 available) with the minimum of effort. The pins are specially custom made, thus avoiding any possible damage to the circuitry.

The RAVEN board provides the user with an extra 20K of usable RAM in screen modes 0 to 3. This together with the aid of software makes the system completely transparent to both the user and the computer.

The RAVEN-20 software ROM gives much more than just the standard commands, it has been programmed to give more and better commands! Priced at £69.95 inclusive of VAT. Please add £1.50 for post and packing.



RAM-ROM BOARD

The RAM-ROM extension board gives an extra 6 sockets for extra ROM's and 2 slots of RAM. This RAM is not an extension of BASIC. It is intended that the RAM be used to develop your own ROM based software. There are in fact seven sockets on the board, the 7th replaces the socket on the main board that would otherwise be taken by the ROM board. (The RAM-ROM board can accommodate both 2764 type EPROMS as well as 27128 EPROMS and ROM).

The RAMAMP board will not cause overheating. It comes with fully fitting instructions, tested and heat tested before despatch.

Prices: 1 x 16K RAM fitted £55.00. 2 x 16K RAM fitted £65.00.

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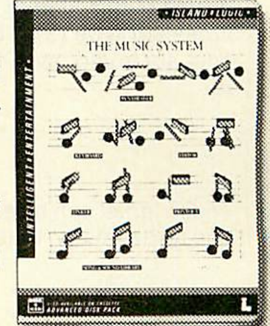
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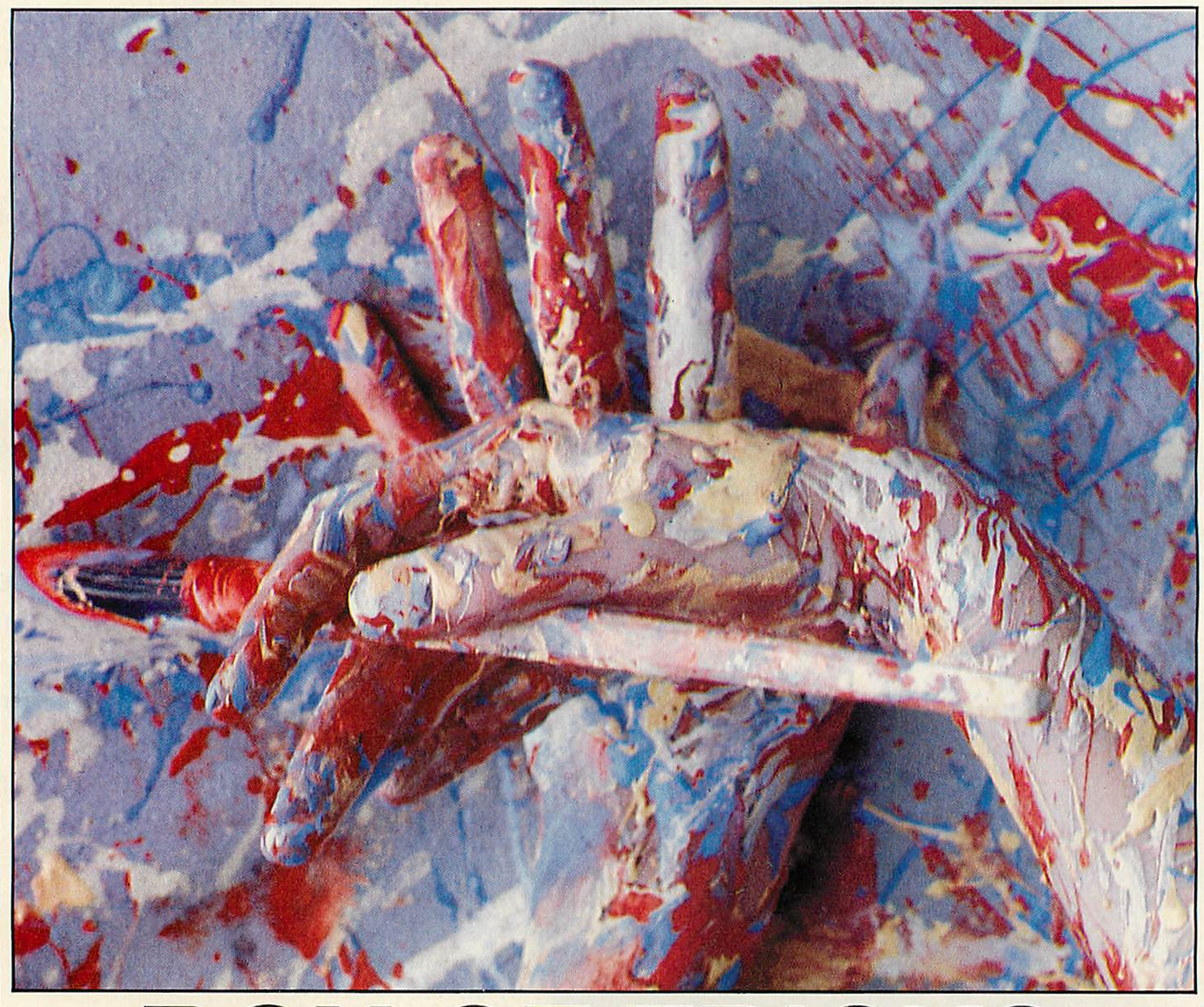
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BOX OF TRICKS

Open Rob Fenton's Paintbox for a wide palette of graphics facilities

PAINTBOX is a painting/CAD program for the BBC B (OS1.2) and Electron based around a special cursor which you move around the screen using the cursor keys. The cursor differs from that of other programs of this kind in that it is not of the crosshair type ('+') but a '+' with four dots surrounding it, forming a square, ie:

```
.  .
 +
.  .
```

These 'dots' can be stretched vertically and horizontally, thus:

```
.      .

   +

.      .
```

At the top of the screen is a colour menu (for monochrome sets the colours are set in order of brightness). To select a colour simply put the cursor over the desired block and press shift. A short beep will indicate your selection and the rightmost block will change to the colour you've selected.

To draw any shape a special method is used. You stretch the cursor up and down and left and right using these keys:

< (,) Shrink cursor horizontally
> (.) Increase cursor horizontally
Z Shrink cursor vertically
A Increase cursor vertically

Each function key has been assigned to a special drawing aid – for example, Airbrush (see function key table). When you are at the desired area on the screen, press the appropriate function key. If you selected Square, a square or rectangle will be drawn within that area; if you chose Circle a circle or oval of the diameter indicated by the cursor will be drawn. This method may seem more complicated than the usual way of drawing shapes on CAD programs, but once you have used it you should find it an easier method. To delete any part of your picture you simply use black or the current background colour to 'erase'.

Three main cursor 'speeds' are used by *Paintbox*, selected with the following keys:

'–' (minus)	Slow cursor
'+' (plus)	Medium cursor
'*' (asterisk)	Fast cursor

At any time ']' will increase cursor speed and '[' will decrease it. It is best to move around the screen using fast

cursor (set automatically at the start of the program), but select the slow cursor for freehand drawing or solid colour filling (I'll deal with the medium speed cursor later).

All the colour fills I've used are the special PLOT&4D statements exclusive



The techniques offered allow you to 'paint' in a variety of styles

to the 1.2 OS. To fill a shape with red for example, select that colour from the palette and move to the shape and press the minus (−) key. Now hold down 'P' (Paint) and move around any blank spots of your shape and it will be 'painted' in. Beware, however, for if there are any gaps in the outline of your shape, the colour will leak out! You can use two more filling options in which colours can be 'mixed' to produce extra colours and different shades or textures. This can be done as follows:

Press f 5 (mix) and the cursor jumps to the colour palette strip. Next, select two colours by moving to the first and pressing CTRL, then the second and press Shift. If you want purple, for example, select red then blue, remembering that mixing colours on a computer is different from mixing normal colours – sometimes the effect will be to change the texture rather than the colour.

There are four ways of laying this mixed colour down.

- Use vertical fill (f 2), then go through the same procedure as you would for a solid colour fill.
- For 'perspective' dot shading fill at the '+' (medium) cursor speed, which produces nice effects.
- Use horizontal fill (f 3) and '+' (medium speed cursor), then fill the shape as normal.
- The second and third effects can be combined to produce a waffle-type texture.

The 'rubber band' mode is a commonly used drawing aid and is essential for CAD. The rubber band mode is on permanently, but when the line is 'off' it is not noticeable. Pressing O toggles between 'on' and 'off'. When 'on', a line appears from the middle of the screen and stretches to where the cursor was previously positioned. Using the cursor keys, this line can be stretched and moved around, like an elastic band, without destroying any of the background it passes over. When you are satisfied that you've got the line in the right place, press 'F' (fix) and it will be drawn permanently. If you fix the line when it is off, the position of the cursor will be considered the new origin for the rubber-band line.

The 'V' and 'H' keys can be used to aid all drawing. They will turn exten-


Many of the facilities available were used to create this house

sion cursors on and off. Press 'V' and a flashing line will be drawn from the bottom to the top of the screen through the current cursor position – a bit like a ruler. Pressing 'V' again turns the line off.

Keys

f 0 Square
f 1 Circle
f 2 Horizontal fill
f 3 Vertical fill
f 4 Airbrush
f 5 Mix colours
f 6 Wipe/Clear screen
f 7 Draw shapes using lines
f 8 Fill in shapes
f 9 Draw shapes using dots

P Paint
D Dot
O Rubber band line on/off
F Fix rubber band line
COPY Copy section of screen
DELETE Dump section of screen
SHFT/S Save screen
SHFT/L Load screen
[decrease cursor speed
] increase cursor speed.

The 'Airbrush' facility of *Paintbox* can be used in various applications. When f 4 is hit, a pattern of random dots is drawn within the range of the cursor. The slower the cursor speed, the closer together are the dots. If fast cursor has been selected, a loose brush-stroke effect will appear, whereas a slow cursor speed will produce a smoke-like effect. The cursor speed affects the speed at which the brush-stroke will be drawn; I use a medium-speed cursor and a small cursor area for airbrush.

The other special feature of *Paintbox* is its facility to hold a section of screen in memory (in fact, the four-point coordinates of a block section of screen) and reproduce it elsewhere on the screen. Like Airbrush it is rather slow, but is nevertheless very useful. 'Copy' records an area of screen within the cursor and 'Delete' places it at the current cursor position.

See yellow pages 97–98 for Rob Fenton's Paintbox program and Electron conversion notes

Main variable names/functions

CX and *CY* These variables hold the horizontal and vertical values of the dots around the cursor, initially set to 48.
IC% This holds the cursor speed, initially set to 16 (this means the cursor will move four pixels at a time – 16/4).
X% and *Y%* Cursor position on screen, initially set to 640 and 512 respectively.
C% Currently selected colour, set to 7 at the start of the program.
M% This holds the position of the menu; when Y% > M% the cursor is in the menu area.
L% Indicates whether rubber band line is on or off, −1 if on and 0 if not.

Main procedures

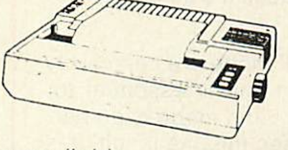
PROCKEY Tests to see whether any of the main keys are being pressed (all keys are detected using INKEY – n).
PROCCUR Draws the cursor using a loop and GCOL3, colour (if rubber band is selected and the rubber band line is on then this routine is skipped and the line is drawn instead of the normal cursor).
PROCCHECK If cursor has gone off the edge of the screen this puts it back on the other side, giving a wraparound effect.
PROCCRCHECK Makes sure the rubber band line doesn't wraparound like the normal cursor.

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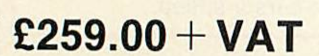
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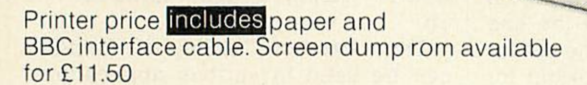
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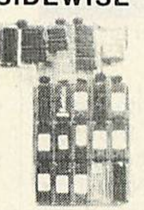
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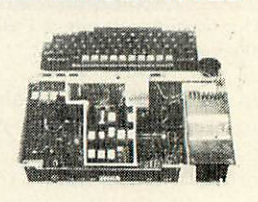
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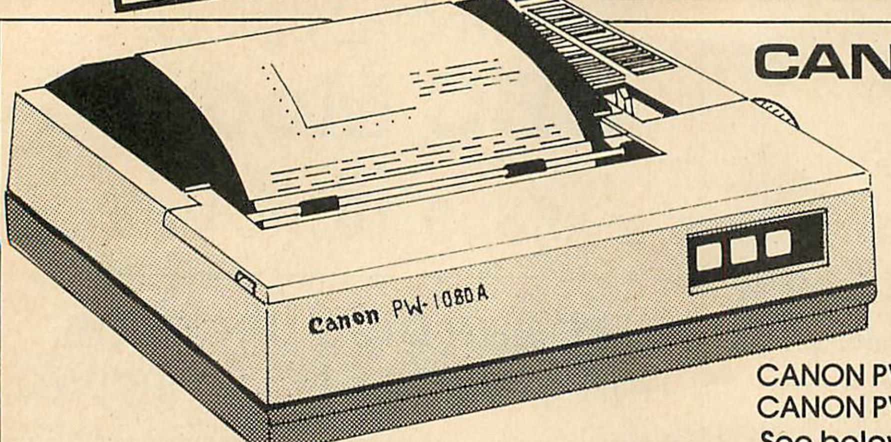
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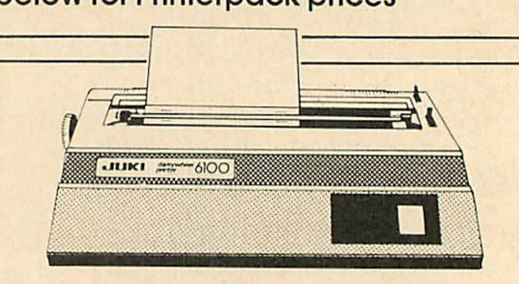
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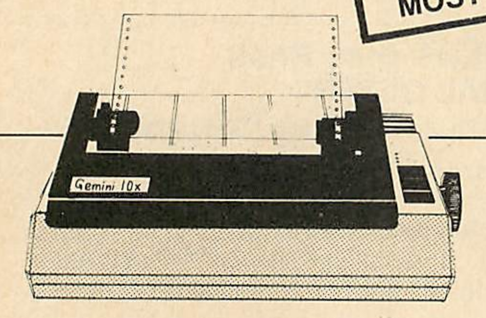
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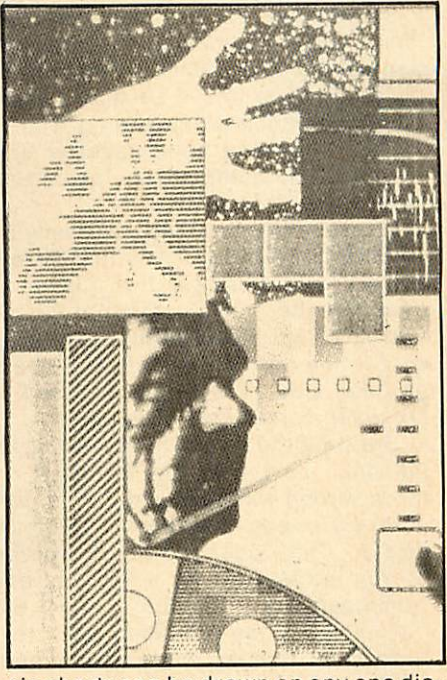
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Make your reports look more professional with Peter Sandford's programs for the graphical presentation of statistics

LAST month I presented assembly language listings for two fill routines. One of them, Dotfill, was developed primarily for use in graphics applications requiring the full 80-column text and high resolution of the mode 0 screen. This article offers Basic listings that use the Dotfill routine as the basis of a package for graphical presentation of statistics.

The main program (listing 1, yellow pages 99–102) has been developed as a set of general-purpose procedures for production of diagrams and maps in a standard format. Controlled by a main menu of program options, these procedures handle all input/output of information, labelling, storage and printing of completed screens. This common core of routines (lines 70-1870) can be used as the basis for development of programs to produce many different kinds of diagrams by simply appending procedures specific to that particular application.

The routines at lines 1880 onwards in listing 1 extend this main core program to plot pie charts. Listing 2 provides a set of procedures that modify the program to plot bar charts. Sample output from both programs is shown. As can be seen, the results are of high quality and compare favourably with those of commercial packages. The routines were developed for use in a published report summarising population information from the 1981 national census and could be of benefit for educational or small business applications.

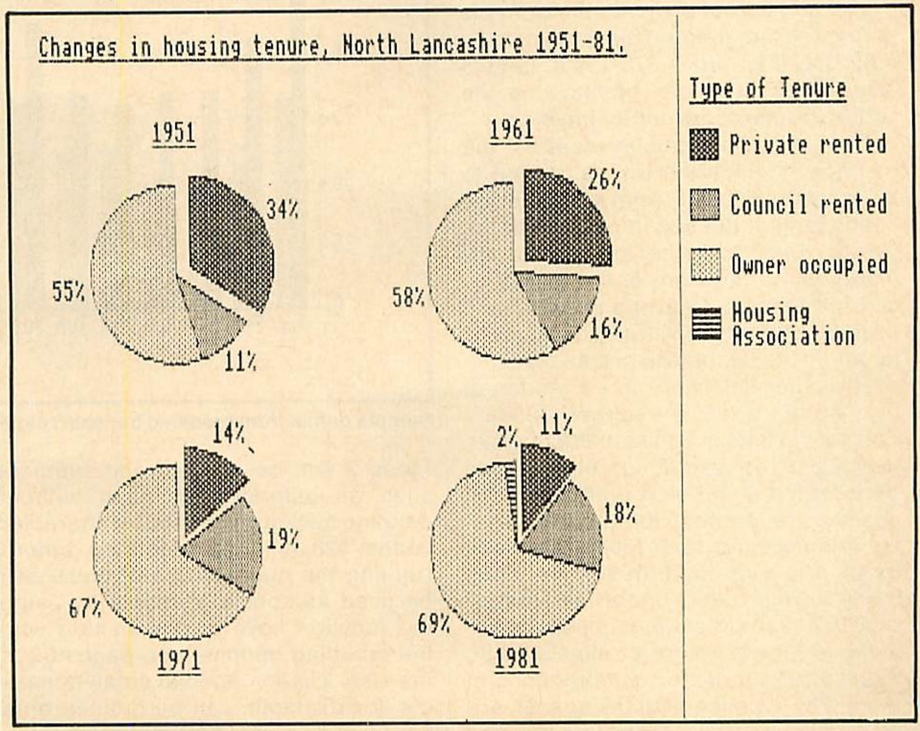
To be of practical use, the programs require a dot-matrix printer to obtain 'hard copy' of the completed diagrams. A call to a suitable screen dump routine should be added at line 930. The programs have been developed for use on a disc system, offering speedy and convenient storage and retrieval of part or fully completed diagrams. They will, however, work on tape-based systems, and details of conversion are included with the listings. Disc users should note that both programs require PAGE to be set to &1500 before loading, to allow sufficient memory space to run them.

Peter Sandford's graphics listings are on yellow pages 99-102.

The pie chart plotting routines in listing 1 have been designed to be as versatile as possible. Up to four individual pie charts can be drawn on any one diagram, and the routine automatically adjusts the positioning on the screen (lines 2040-2080). Each pie can have up to five individual segments, which can be shaded with either user-selected or preset tones (specified in the DATA statement at line 1850). A key to these tones is automatically drawn and labelled. The sectors can also be automatically labelled as percentages.

Before drawing each sector, the user is given the option of 'exploding' that sector outwards from the centre.

The bar chart plotting routines of listing 2 offer a similar range of options. Up



Sample output from pie chart plotting routine (listing 1)

to 20 individual bars can be drawn, and the routine automatically scales the bar-width to suit. Each bar can be subdivided into up to five sections, which can again be shaded according to user-selected or preset tone patterns. The routines also automatically scale and label the vertical axis.

The bar chart routines can easily be adapted to present charts in different formats. To illustrate this, listing 3 offers an alternative version of PROCbar, which can be substituted to display data in the form of sets of single bars grouped side by side (as opposed to multi-segmented bars of listing 2).

The standard screen format set up by the main core program is based on three screen windows. The major part of the screen is used for the graphics display. The right-hand quarter of the screen is reserved for a key and any accompanying notation, and the bottom two lines are used as a text window for printing prompts and input of information.

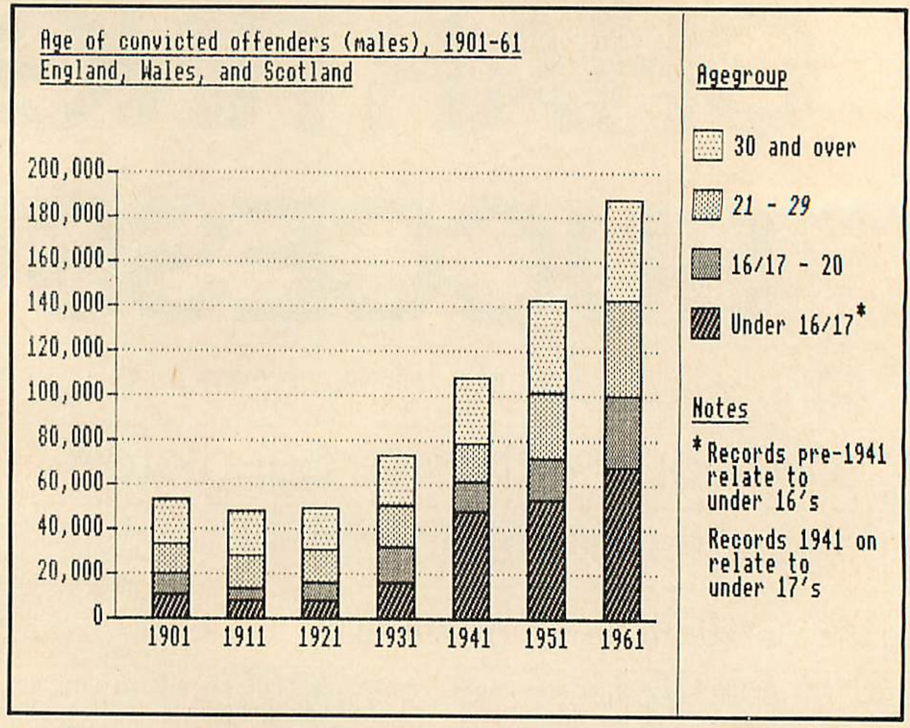
The program offers two facilities for diagram labelling. First, PROCkey (lines 1600-1670) can be used to draw and label key entries automatically for any of the Dotfill tones used in the diagram. Each key entry can have a title of up to 25 characters, and a second procedure, PROCdrawlabel (lines 1690-1750), is used to split this title automatically into two lines if it is more than 16 characters. Listings 1 and 2 demonstrate the use of this procedure to anotate the tones used for the different segments of the pie chart or bar chart.

The other labelling facility is a powerful standard option available from the main program menu. This is controlled by PROClabel (lines 970-1100). Labels can be drawn at any position on the screen by use of the cursor keys.

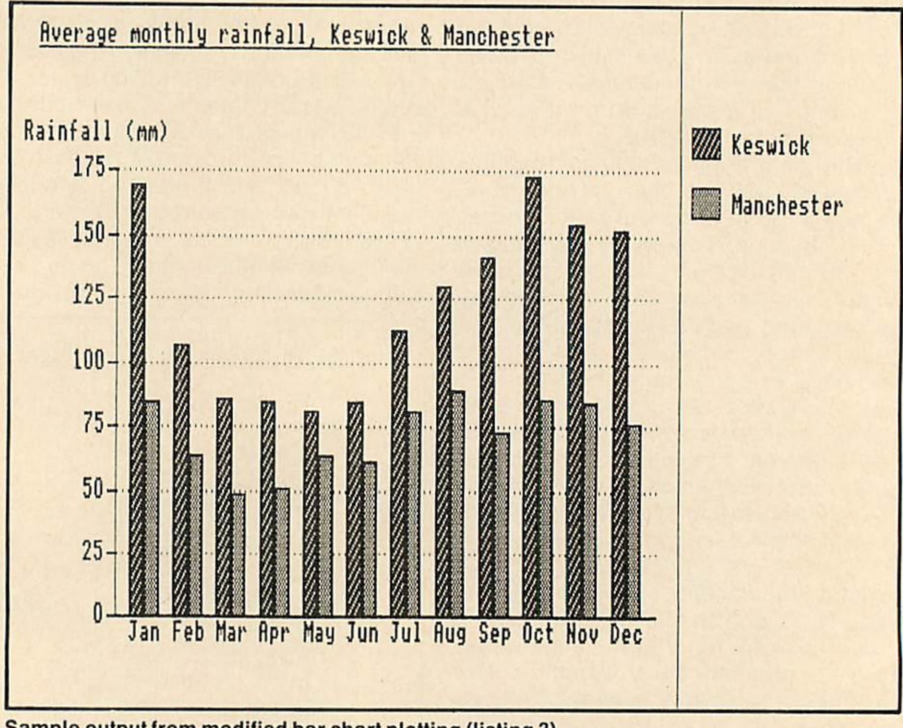
Two sets of options control the manner in which the text is printed to the screen. One of them controls the positioning of the text in relation to the cursor. This can either be printed immediately to the right of the cursor or centred about it. Centring is especially useful for titling individual pie charts or for adding text labels to graph axes.

The other set offers three modes of printing the text to the screen. Mode 1 deletes the background behind the text, which can be useful for highlighting parts of the completed diagram, or, if spaces are printed, for deleting sections of existing text. Mode 2 retains existing background detail, as does mode 3, which offers underlined text.

With a little practice, it is possible to achieve a wide range of effects using these three modes or combinations of them. For instance, if blank spaces are printed using mode 3, existing text can be underlined without overprinting it.



Sample output from bar chart plotting routine (listing 2)



Sample output from modified bar chart plotting (listing 3)

Mode 2 can be used to add symbols such as asterisks to maps without deleting background detail. If character codes 128-137 are redefined before running the main program, these can be used as special symbols by using the function keys in conjunction with the labelling options (see page 439 of the *User Guide*). Special small numerals, for example, can be defined on a 6x5 pixel grid and used in this way.

Finally, listing 4 presents a further set of procedures which can be appended to listing 1 to form a general-purpose utility program. This allows any pre-drawn map or diagram to be loaded from disc or tape and shaded using Dotfill. The cursor is simply positioned at a point within the area to be filled, and any of the 24 Dotfill tones can be used.

On entering the routine, the user is offered the option of creating a new key entry for the tone selected.

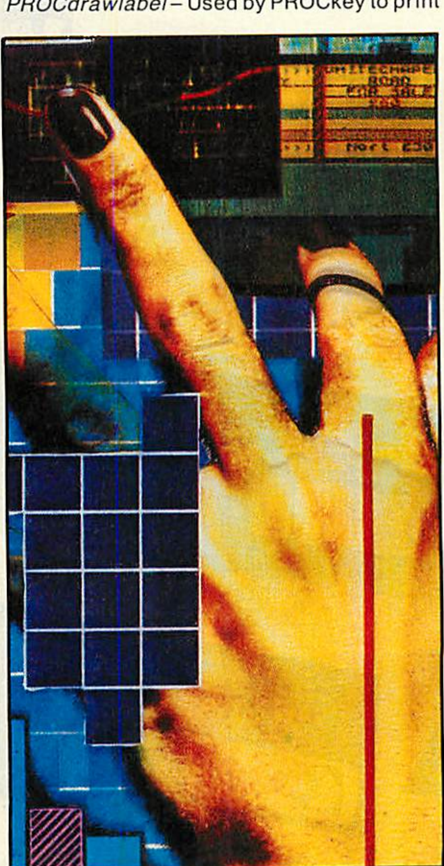
PROGRAM NOTES

LISTING 1
Conversion for tape systems

Line 60 ensures that PAGE is set to &1500 and, if not, reloads from disc. Tape users should delete this line and set PAGE to &1200 before loading the program. The LOAD address for Dotfill in line 70 should be changed from &1200 to &F00. Dotfill itself should be stored on the tape immediately following the main program so that it can load in sequence. If the program is to use a machine code printer dump, this will also need to be stored in sequence and loaded into memory at the start of the main program.

PROCs, FNs and variables

Lines 110-210 – Main control loop.
PROCerror – Error handling routine. Resets screen output to bottom two lines, reports error and gives user the option of re-entering main program loop. Line 290 redefines zero font to slashed zero before exiting.
PROCinit – Initialises screen and variables.
Lines 390-400 – Pad out all string variables to avoid Basic 1 string-handling problems.
Line 410 – Redefines zero to an unslashed font, which can be easier to read for non-computer users.
osblock – Parameter block for OSCLI
data() – Stores values for each pie chart/bar chart segment
tone%() – Dotfill tone values for pie chart/bar chart segments
label$() – Titles for pie chart/bar chart segments
A$,an$,mess$,L$ – General-purpose input and prompt strings
PROCwindow – Selects screen windows.
Window 0 – Text window
Window 1 – Main (left-hand) graphics window.
Window 2 – Right-hand graphics window (area used for key and notation).
Window 3 – Whole graphics area (ie, windows 1+2).
PROCmovecursor – Sets cursor position.
cx,cy – Cursor X,Y co-ordinates.
xs,ys – Current step length in X,Y direction.
ox,oy – Old step lengths.
PROCcursor – Draws cursor cross. Inverse plotting is used, and consecutive calls will plot and unplot cursor.
PROCsave – Save screen to disc/tape.
PROCload – Load screen from disc/tape.
PROCoscli – Call to command line interpreter.
PROCdump – Call to printer dump routine.
PROClabel – Allows text label to be drawn at cursor position.
A$ – Label
L% – Length of label
cur$ – Controls positioning of label in relation to cursor
M% – Labelling mode
FNget – Input routine for single key responses.
mess$ – Prompt message
in$ – Defines legitimate keys
Line 1180 – Converts alphabetic characters to upper case
Line 1190 – Masks out SHIFT characters from numeric keys
FNinput – Input routine for numeric values.
mess% – Prompt message
low – Minimum value for response
high – Maximum value for response
FNinputstr – Input routine for strings.
mess$ – Prompt message
len – Maximum length for response
PROCmessage – Used by input routines to centre and print prompt.
PROCcursoron – Sets text cursor on.
PROCcursoroff – Sets text cursor off.
FNinstr – INSTR function to overcome Basic 1 bug.
PROCkey – Fills and titles a key entry.
L$ – Label text
P% – Vertical position of key entry (1-10)
T% – Dotfill tone value
x%,y% – X,Y co-ordinates of key entry
PROCdrawlabel – Used by PROCkey to print



key text, splitting it over two lines if over 16 characters long.
L% – Used to locate gap in text if it is to be split
PROCfill – CALL to Dotfill routine.
x%,y% – X,Y co-ordinates of start point
tone% – Hatch tone value
PROCinittones – Initialises tone values for automatic selection of hatch tones.
PROCpie – Main pie chart plotting routine.
pies – Number of pie charts on diagram
segs – Number of segments for each pie
ht$ – Controls selection of hatch tones
pc$ – Controls selection of percentage labelling
ex$ – Controls selection of 'exploded' segments
S% – Loop variable for segments
P% – Loop variable for pies
r – radius
xc,yc – X,Y co-ordinates for centre point of pie
total – Total value of data for each pie
scale – Converts data to angular value
a1,a2 – Angles for start/end of sector
a3 – Angle for centre of sector
x,y – X,Y co-ordinates for start of sector
arc – Loop variable for drawing sector
PROCpercent – Labels each sector with percentage value.

LISTING 2
PROCs, FNs and variables

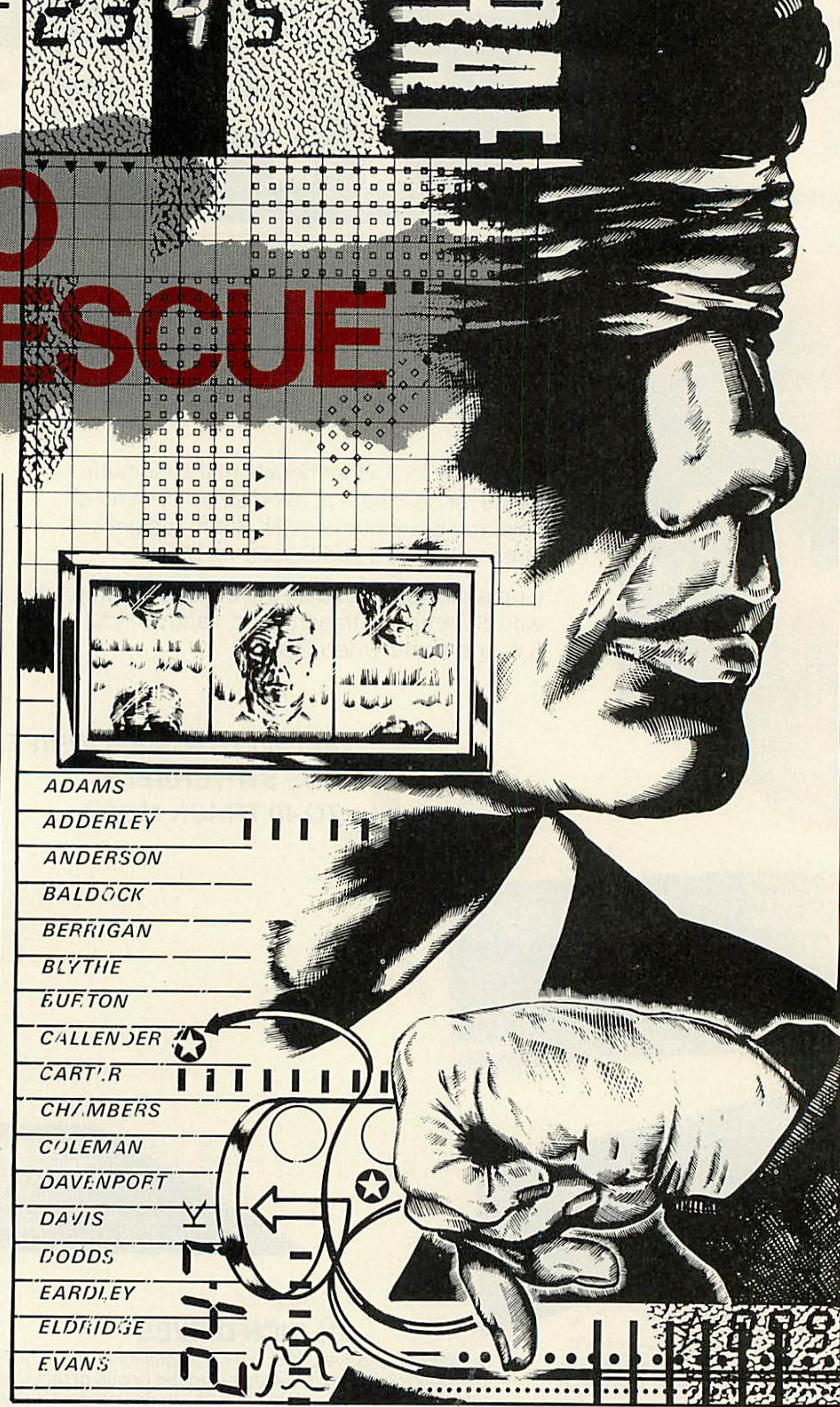
PROCbars – Main plotting routine.
ymax – Maximum value for vertical axis
ints – Number of intervals marked on vertical axis
bars – Total number of bars
divs – Number of subdivisions in each bar
ht$ – Controls selection of hatch tones
S% – Loop variable for bar segments
bar – Loop variable for bars
vscale – Converts data to vertical screen displacement
height – Vertical height of segment
width – Horizontal spacing of each bar
xbase,ybase – Screen co-ordinates for lower left-hand corner of bar
PROCdrawbar – Plots a single bar segment
x,y – Screen co-ordinates for lower left-hand corner of segment
h – Vertical height
w – Width
t% – Dotfill tone value
PROCdrawaxes – Plots and labels axes
val – Numeric value for each interval marked on vertical axis
A$ – String value for each interval
y – Screen Y co-ordinate for each interval
x – Loop variable for plotting horizontal scales

LISTING 3
PROCs, FNs and variables

PROCbars – Main plotting routine.
ymax – Maximum value for vertical axis
ints – Number of intervals marked on vertical axis
sets – Number of sets of bars
nbars – Number of bars in each set
maxbars – Maximum number of bars for given number of sets
ht$ – Controls selection of hatch tones
set – Loop variable for sets
B% – Loop variable for bars
vscale – Converts data to vertical screen displacement
height – Vertical height of bar
width – Horizontal spacing of each bar
xbase,ybase – Screen co-ordinates for lower left-hand corner of bar

LISTING 4
PRocs, FNs and variables

PROCshapefill – Fills from cursor position with selected Dotfill tone.
tone% – Dotfill tone value
cx,cy – Cursor X,Y co-ordinates
PROCkeytitle – Draws key entry for selected tone.
A$ – Label
keypos – Vertical position in key for next entry (1-10).



RAF TO THE RESCUE

Join forces with random access files (RAFs), says Joe Telford

BACK in 1983 I put together some short procedures for handling random access files (RAFs). These were duly exhibited in *Acorn User*, the aim being to provide users who wished to write random access filing programs with some library routines. The months since then have been spent answering mail from users who wanted expansion of those bare routines, plus ideas on how to sort a RAF on disc.

The two considerations which we need to examine for this are: do you have a particular application? and second, do you want to learn about random access filing? If the answer to the first question is yes, then your first tack must be to survey some of the excellent filing programs on offer from advertisers within these pages. If the answer is no, or you are looking to learn about RAFs, then adding to and improving on the skeletal programs presented here will start you on your way.

The easiest approach to filing is to use the same sort of sequential access we deal with in saving and loading files from cassette tape. The time taken to load files of any size and importance from tape is so long that we often buy a disc drive to improve matters. Unfortunately this approach often only delays the real problem which is that at some point we will run out of memory within the micro.

As far as disc users are concerned, provided that graphics and filing are not required together, then the memory allocation of the BBC micro (for filing) can be regarded as follows: language, DFS and OS workspace 6.25k; screen memory 1k (mode 7); memory left for programs, datafile and variables, 24.75k. Often this is not sufficient, particularly because of the overheads associated with arrays, and string manipulation. The result is that in travelling the route from tape to disc, we can load files faster, but they can be no longer. In addition, there is often a point at which both the filing program and the data file need extending. Add graphics, and you will see that the BBC micro's RAM space is not sufficient for many filing needs.

The alternative is to use RAFs, which have two great plus points. One is that they can be almost any size, and the second is that because any point in the RAF can be directly accessed, they can be examined very quickly.

A random access file is a data file created and laid out on the disc in a

special way which makes access to any part of it quite easy. If we imagine that the paper equivalent of a RAF is shown in figure 1, then we have simply to transfer that layout to disc.

Notice that the paper file in figure 1 has three important characteristics:

It has a set of headings, so that we know what each column is about. In RAFs we call each column a *field*, so the headings are the field titles.

Second, it has a separate main body containing information. This is the data file, which might be a school class list, or a list of stock.

...headings

No	SURNAME	FORENAME	SEX

data file... ...record

0	SMITH	BRUCE	M
1	QUINN	TONY	M
2	TELFORD	JOE	M
3	DIPSTICK	NORRIE	M
4	MILNE	KITTY	F
5	MILLS	MARJ	F

Figure 1. Paper file

Finally, the data file is split into *records* containing information on one member of the file. Each record in a RAF should be the same length. Not only are all the records identical in length, but also each entry in any one column must be the same length. In paper files, it is easy to do this, and in computerising the paper system, we must add spaces to make all the entries identical in width. In some rare cases an entry might be longer than the space available in a column entry. With the paper system we can simply squeeze it in. In the computer version we must lose the extra information in that entry, so that the record will not be extended.

Random access files rely entirely on good management of strings of data. A mistake in one field can have consequences in all the following records.

Starting the RAF

The most important thing with RAFs is the initial file design. Make sure that you have decided on *all* the information required; *all* the headings and their character widths; and the length of the file (limited by disc space).

The next stage is to put the RAF onto disc. This is quite a task, but it can be broken down into stages:

- Create a program to write a heading file, which all the other programs can use.
- Make the heading file.
- Create a program to use the heading file to initialise a blank RAF of the correct size for your application.
- Create the data file.
- Create a program to allow information to be placed directly into the data file, and use the program as required.
- Create programs to perform tasks such as searching, printing, amending, deleting, and sorting the file on disc.

Listing 1 contains the skeleton working code for the heading program. Notice it operates around the DATA statements of lines 2000 to 2030. The order of data is important. The first number, 12 in line 2000 tells the program that there are 12 columns in our heading file. Next come the column headings, each followed by the amount of space allocated to them. The program simply transfers this information to disc in a file called 'D.Heading'. Note that 'D.Heading' is a sequential file, not a RAF. Once the information is on disc, it can be used by any RAF program, by simply sequentially reading its contents, and using the information as decided by the programmer.

It is important that the first column should contain the record number of each record, because this allows us to access each record directly, without searching for it.

Listing 2 is the skeleton code for constructing a RAF from the information in the heading file. First this information is loaded, using PROCload, and then the program uses a filename supplied at line 130, and a file length added as a parameter in line 140, to create a RAF called 'D.roll', of 30 records, each of

Girls	
KITTY	MILNE
MARJ	MILLS
SOO	CLARCH
Boys	
BRUCE	SMITH
TONY	QUINN
KEITH	PERISH
JOE	TELFORD
NORRIE	DIPSTICK
LITTLE ROB	PICKERING

Figure 2. Class list

which has 12 fields. The fields are initially set to full width, padded with blanks, by the FOR. . .NEXT loops of lines 10230 to 10260. Although it isn't yet obvious, the space taken up by each field is two characters more than the size specified. This is because the PRINT# and INPUT# commands need two extra pieces of information in two bytes at the front of each stored string, to function correctly. The speed of PRINT# and INPUT# in comparison to BGET# and BPUT# makes this approach worthwhile.

The program to enter the RAF, listing 3, is a little longer than the others, and would benefit from a good general purpose input routine (see last month's Jottings). However, as it stands, it shows how information can be entered into the RAF.

Line 130 is important because it calculates the physical record length on the disc. This will allow us to move between records accurately and speedily. Notice that the procedure of adding a record to disc has three parts: FNwhichrecord lets us choose a record number in the correct range, set in line 3260; PROCgetrecord lets us INPUT the required record, one field at a time (excepting the first field which, containing the record number, has already been specified); PROCwriterecord, which PRINT#s the record to disc. Note that in its current configuration this program will let you overwrite records. One direction for improving the program would be to check each record for contents other than spaces, and ask for confirmation to overwrite.

You may have noticed that my whole philosophy of RAFs is based around strings. Nowhere can numbers as such be found. The reason for this is that much of the repetitious part of random access filing can be best performed by library routines making use of REPEAT . . .UNTIL or FOR. . .NEXT loops. These really require data in a homogenous format. Strings are most appropriate, and if for example you have a field (say field 7) which is 'Cash paid per week', then a specific and simple RAF program can be written to handle the totals for that column.

```
180........
190total=0
200FOR record=0 TO count
210cash$=FNinputfield(7)
220total=total+VALcash$
230NEXTrecord
240.......
```

Now let's move on to an application based on a school class called 3X. Imagine that we wish to computerise the school records to obtain class lists, etc. Using the programs shown so far we can enter information on our imaginary class 3X. We could however make use of one program to print all the information about the pupils, and another to print class lists.

Listing 4 will print a complete list of the RAF contents, and altering PROCprintall will allow a class list to be printed. All that happens is that each record is read in turn and printed out according to the format of lines 5060 and 5070.

Listing 5 prints a class list in order girls, boys, and takes a little more setting up because it must make two passes through the RAF. Examine lines

140 to 170 which make the two passes, and line 5060 which checks field four for male or female respectively and prints accordingly. Note also the addition of PROCsetup which eases the printing of titles, and checking sex using arrays.

Let us now take a class print out from this list and examine it (figure 2). Here we have the girls and boys of class 3X separated out, but not in alphabetical order. In many filing applications, apart from class lists, the order of data becomes important. What we need is a method of sorting the RAF on disc into alphabetical order, using a *keyfield*– the field on which the sort will be based.

Sorting a RAF

Sorting arrays can be a lengthy task, and when we sort a random access file on disc, it takes even longer because we have to add on the time taken for read/write operations.

The two main problems with sorting random access files on disc are: every field of a record must be swapped if the key field must be swapped: in applications using record numbers to access particular items on file these numbers become useless, as they are re-ordered with the rest of the file. For example, record 49 might move to become record 1.

Girls	
SOO	CLARCH
MARJ	MILLS
KITTY	MILNE
Boys	
NORRIE	DIPSTICK
KEITH	PERISH
LITTLE ROB	PICKERING
TONY	QUINN
BRUCE	SMITH
JOE	TELFORD

Figure 3. Sorted class list

The solution to the second problem is to renumber the record numbers after the sort, so that after every sort the numbers begin at 0 and continue in order through to the last record in the file.

The solution to the first problem is to reduce the number of passes through the file. This can only be done by regular sorting, with a suitable sort like the bubble sort, which can check for zero swaps and then exit from the sort as soon as it is complete. The other value of the bubble sort is that it demonstrates RAF sorting in an easily understood way.

During our sorting program, we will need to exchange records, in much the same way as we would exchange array elements. To this end we need somewhere for the records to stay in memory, during comparison. One useful technique is to read two adjacent records, field by field into two string lists; for example we might use 'low$(. . .)' and 'high$(. . .)' as our two lists. We could then write them to disc in the reversed order (figure 4).

```
5200DEF FNswap
5210LOCALfield
5220PTR#channel=PTR#channel-2*reclength
5230FOR field=1 TO 9:PRINT#channel,high
$(field):NEXT
5240FOR field=1 TO 9:PRINT#channel,low$
(field):NEXT
5250=1
```

Figure 4

The result of the =1 at the end of the function is to set a flag within the sort routine, which will enable an early exit from the sort, if no swaps are made.

To properly sort the file we need two parameters: the keyfield on which to base the sort and the number of the last record in the file. Normally, we would enter the first parameter from the keyboard but the second must be calculated. This calculation relies on knowing the record length, which must be constant through the file.

We need a statement such as:

```
count=EXT#channel DIV reclength -1
```

Then we can call the sort routine with a line like:

```
PROCsort(field,count,reclength,fields)
```

Listing 6 shows the skeleton of a RAF bubble sort. Lines 5090 and 5100 ensure that empty records (containing spaces) will be regarded as full of z's so they will end up at the end of the file. Missing these lines makes the empty records start at the beginning. Notice that line 5110 invokes the swapping procedure, and if no swaps are made in any 'inner' pass, line 5140 sets the 'outer' loop to its final value. Because all filing programs generally do nothing as far as screen display is concerned, line 5030 has a PRINT"."; inserted to keep the user informed as to the state of the sort. Each dot printed represents an 'outer' loop, and the total number of dots will vary between one and the number of records.

The other problem which will exist, if records have been laid down in order of record number as suggested, is that the record numbers will now be out of true with the physical record location. Sorting a file like this means that the record numbers will have to be re-ordered to match the new locations.

This requires the renumbering procedure appended to listing 6. It simply resequences the records from 0 to the last record met. Using this technique it is valuable always to print the new file after sorting it, to show the new record numbers.

Figure 3 shows the result of using the sort program on our class file.

Problems with sorting

If a large application has been running for a while, and paper filing systems are based on the record numbers of the disc file, then renumbering the record numbers, and indeed physically sorting the disc file can prove disastrous, as many people may rely on the previous pattern of information.

A particular example is in a stock file where parts might be added and deleted from file by record number, and hence each part may be labelled with its record number. It would be fatal to sort the file, renumber it and then find that instead of removing, say, six blank tapes from stock, the computer thinks we have removed six disc drives.

If record number is important, but an application demands an alphabetic sort based on a field prior to print out, the best approach might be as follows:

- Copy the RAF on to another disc with *COPY 01 D.ROLL and *COPY 01 D.HEADING
- Sort this new file, but don't renumber the records.
- Do any printouts from the new file.

Remember, the old file is the master and as it will be continually updated, the newly-sorted file will become out of date. Whenever we wish to re-sort, we must therefore recopy the master file and start again.

We may need to maintain a number of copies of the master file, each one sorted on a different field. If this is the case then we must take great care to label the various discs. In any case readers might like to back-up their master files, while they practise their skills with random access filing, in case of difficulties.

● This article is based on the RAF section of Joe Telford's book *The BBC Micro: Advanced Programming* published by Prentice Hall.

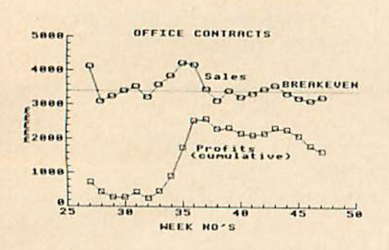
Turn to pages 103-105 for Joe Telford's RAF listings

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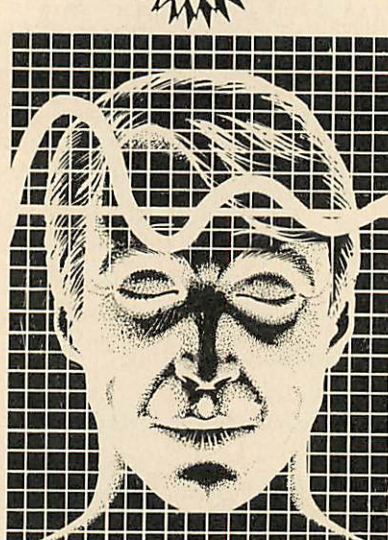
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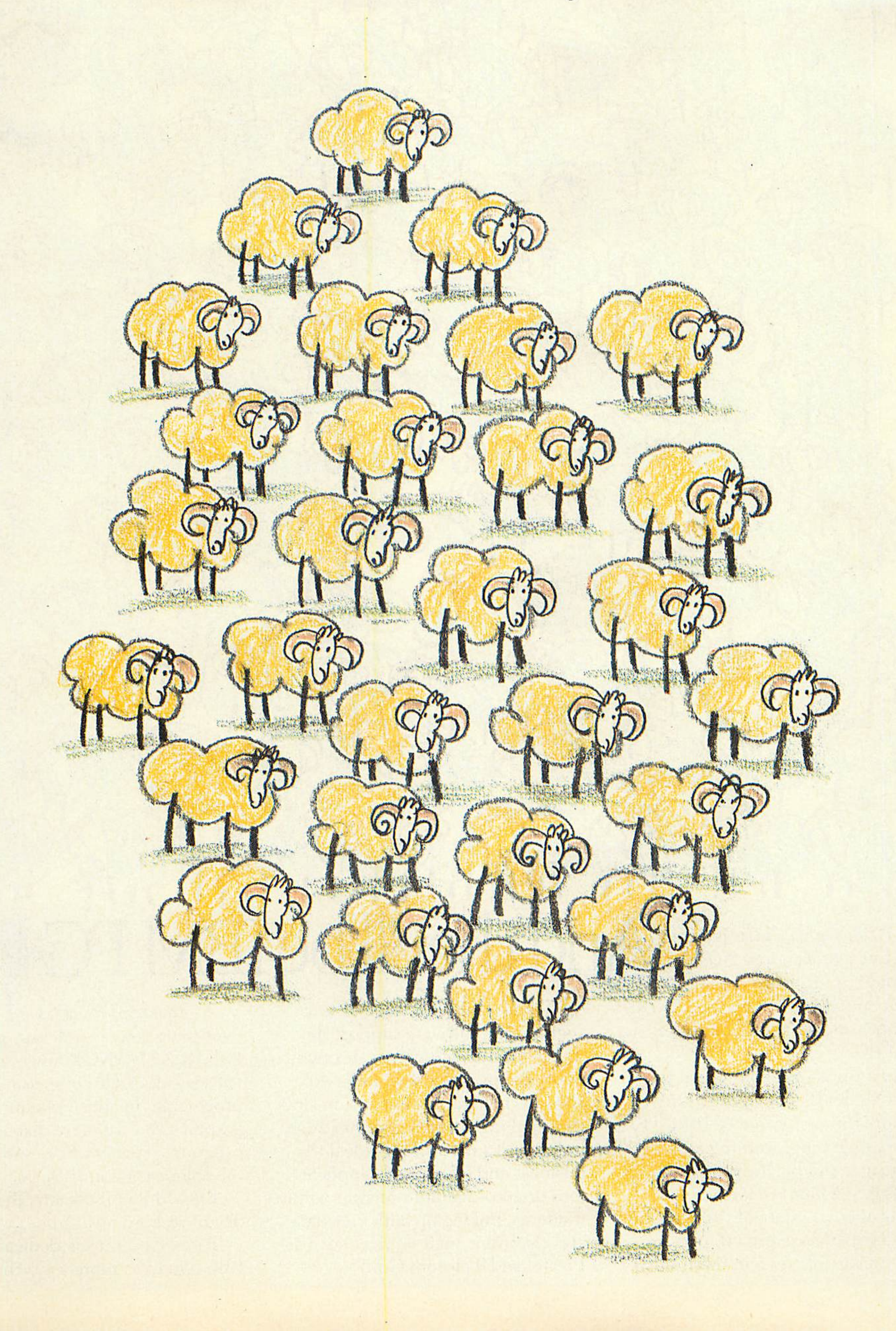
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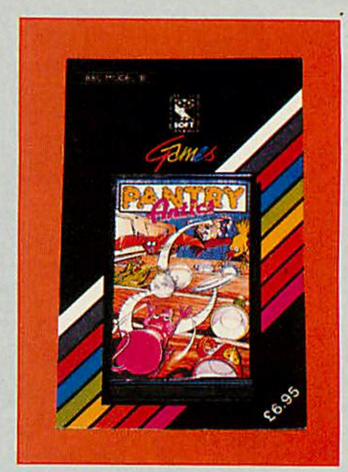
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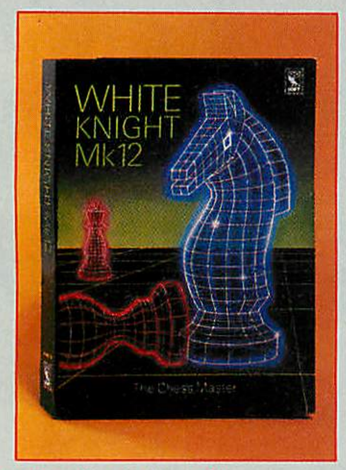
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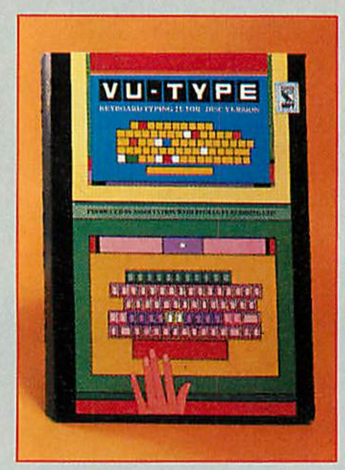


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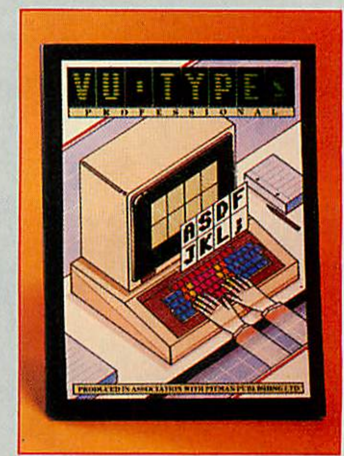


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We've got two Silver-Reed EXP400 printers to be won if you can settle the demented duel in the dungeon, devised by Simon Dally

DUEL OF THE DIALS



A Silver-Reed EXP400 printer, waiting to be won

DEEP in the *Acorn User* dungeon there is a room guaranteed to drive its inmates insane. It consists of a vast bank of dials – 50,000 of them in fact. Each dial is identical and has eight different settings, which are, reading clockwise, blue, red, green, black, orange, purple, brown and grey. The dials are all set to blue.

A demented contest now takes place between two inmates: The first starts at dial number one and turns it one setting in a clockwise direction so that it now shows grey. He does this to the remaining 49,999 dials in turn. Then he goes back to the beginning and turns every second dial clockwise two positions. Then he returns and turns every third dial three turns clockwise. He continues in this fashion so that after 49,999 passes, he turns the 50,000th dial 50,000 positions clockwise. At this point a count is taken of the number of dials set to orange.

The second player now takes over. His task is more complicated. He first looks at the colour setting on each dial and then turns it clockwise by the same number of positions as there are letters in that colour. Thus, if the dial is showing red, it gets turned three positions; if it's orange it gets turned six, etc.

He first performs this operation on every dial; then, like the first player, he goes back to the beginning and performs the operation on every second dial, then every third, etc, until he too has made 50,000 passes. When he's completed this, the number of dials showing orange is counted.

The winner of this contest is the player who has the largest number of dials showing orange after completing his 50,000 passes.

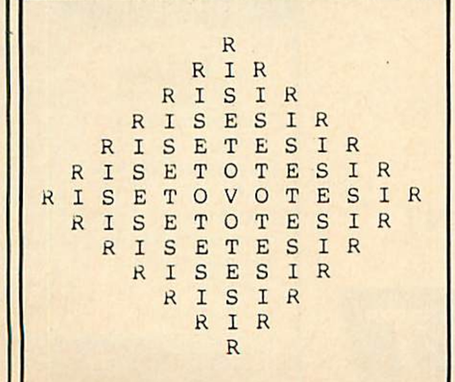
Since no-one has yet finished this contest, old-age and boredom usually intervening, it's not known who the winner is.

Can you, using your micros, discover how many dials reading orange each player gets respectively?

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    R I S E T E S I R
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R I S E T O V O T E S I R
  R I S E T O T E S I R
    R I S E T E S I R
      R I S E S I R
        R I S I R
          R I R
            R
```

OUR October competition, slightly easier than usual, produced a healthy entry – nearly 200 of you. You had to find as many ways as possible of reading the palindromic sentence RISE TO VOTE SIR moving in any direction in the diamond of letters.

There is an equation to solve all palindromic puzzles of this nature, as some of you pointed out. It is:

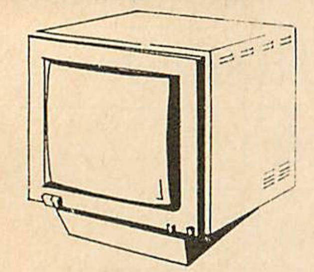
$$[[[2^{((n-1)/2)}] - 1]*4]^2$$

where n is the length of the palindromic sentence (stripped of spaces). In this case the palindrome is 13 letters long and therefore the number of ways it can be read is 63,504. The winners of the Acornsoft packages were Mary English of High Wycombe, Andrew Watt of Edinburgh, S Evans of Slough, Alan McPherson of Hemel Hempstead and John Grobben of Rotterdam, Holland. The runners-up have been notified by post.

A special mention to the BBC Micro Club of Tenerife who sent us a warm message and included their president's program to solve the puzzle on a BBC, which we reproduce on the letters pages.

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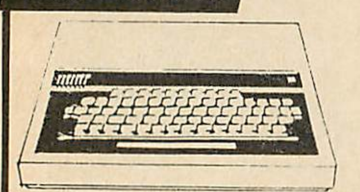
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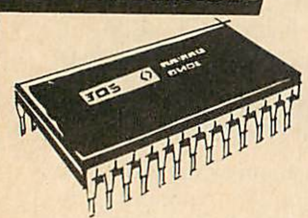
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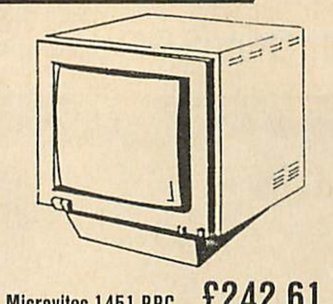
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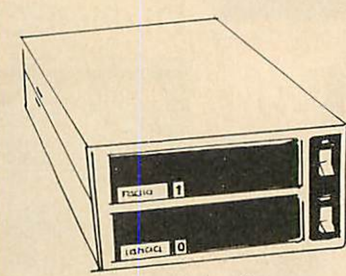
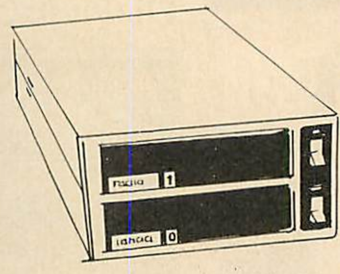
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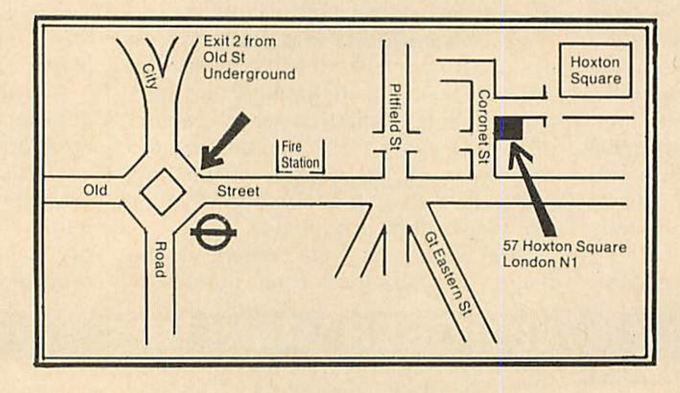



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6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.

7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1). ***

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2). ***

9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3). ***

10. May Review of Basic II. Graphics listings. New *FX calls in OS1.2. Colour mixing on the Beeb. Jazz, blues and folk on the BBC. Schools 5 – language development. DIY Beeb interface box. Atom sound board. A to Z of printing: how to get going. Hints and Tips: PROCs, discs and FNs. Printer, software and book reviews.

ACORN USER
BBC micro, Electron and Atom magazine
GRAPHICS: mixing colours
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PRINTERS: the easy way
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BBC: new Basic
MUSIC: folk, jazz blues on a BBC micro

11. June Techniques series – sorting. Hints and Tips: 50p network. Drawing techniques and CAD. Machine code: interrupts. Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps. Comparitive review of *View* and *Wordwise*. Three graphics packages reviewed. Test of *Acorn User*'s interface box.

12. July Techniques – hash tables. Hints and Tips: logic made easy. Recursion and graphics. Handling strings. Two ideas for passing variables. Beeb aids the blind. DIY second keyboard. Beeb Forum. Sounds on the Atom. Hardware, firmware, software and book reviews. Atom Forum.

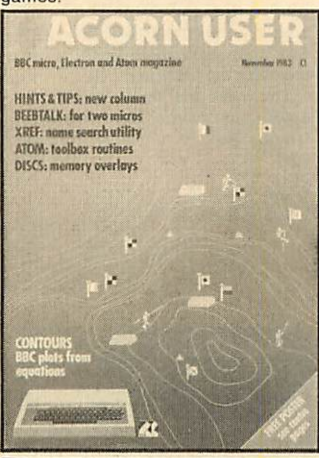
13. August Printer graphics and dumps. Techniques – Tree structures and sorting. All the fun of the fair. 40/80 disc copier. Colour painting. Basic II: random access files. Screen dumps for Olivetti, Centronics and Seikosha. Atom strings. Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.



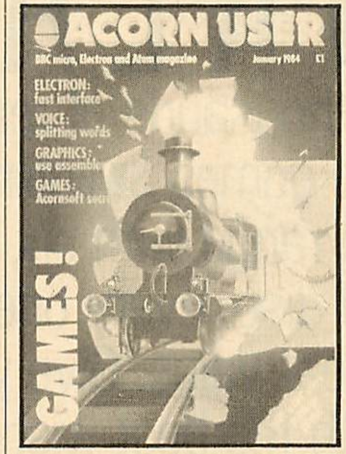
15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*. Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler ultilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms ... or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure. Reviews of ultilities, software, *Beeline* wordprocessor, educational packages, two chess programs.



19. February: Adventures special issue Techniques – efficient sorts. PROC for a numeric keypad on the Beeb keyboard. 12 graphics listings. Random access filing on disc. Locking files. MCP40 printer/plotter looked at. Hints & Tips. Beeb Forum. Make discs readable on 40 and 80 track drives. Screen memory organisation. Hints on adventure design. Adventure action. Adventure ideas in computer language. Text compression. Word-crunching. VIA chip on Electron to drive a parallel printer. Atom Forum. Schools – simulation packages. Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp 1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV. 6845 chip explored. Advanced filing systems. Lisp 2. Hints & Tips. Beeb Forum. Choose disc tracks to copy. Function key editing. Teletext dumps. CES scrutinised. Passing variables. Computer Concepts' graphics ROM. Schools – simulations. Calculating Easter dates. Better programming. Atom Forum. Atom ROM routines. Converting BBC to Atom Basic. Three printers compared. Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.

22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.



23. June Acorn Z80 second processor. Forth. Graphics to brighten up your games. Soft Pottery graphics. Go faster and save memory space. Rapid search and load routine for tapes. How the Beeb and Electron work 1. Business: reviews and how to gently enter office computerisation. Education – adult literacy. Dumping Atom programs on the BBC. Atom Forum. Software copyright laws. Hints & Tips. Techniques – B-Trees. Beeb Forum. Reviews of monitors, printers, books, software, adventures, EPROM programmer.

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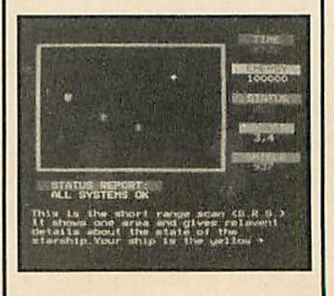
TREK was the first game to take advantage of voice synthesis on the BBC micro – and uses joystick or keyboard.

Trek puts you in charge of a Starship with the task of wiping out an alien fleet. It's an excellent adaptation of the classic game with 7 screen displays, 3 on-board computers and 2 weapon systems.

Versions have been written for BBC micro and Electron to use both machines to their full. The BBC tape uses voice synthesis (if the chips are fitted).

The game has been extensively developed from Tim Heaton's famous Trek III. It barely fits into 32K.

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SWORD MASTER is one of the few two-player games around, and is designed for joystick or keyboard.

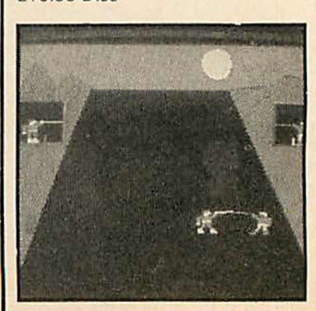
Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutscritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between two knights.

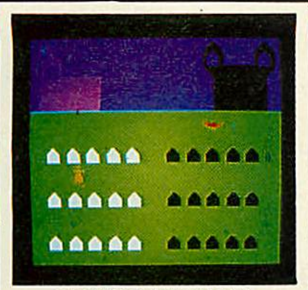
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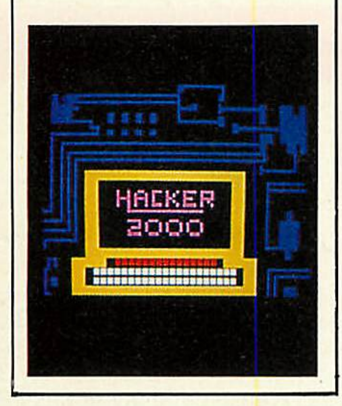


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You may gain vital information with the assistance of the Duty Android in a tour of the complex. If you manage this, you're on your own. From here on you start to appreciate the originality of the game in its representation of a real-time system. You'll need all your powers of logic and some lateral thinking to use the information you glean to 'hack' through the Multivax systems. Your goal can be reached in an unlimited variety of sequences.

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In this superb machine code action game by Ken Worrall you assume control of the body's defences, journeying into the three-dimensional labyrinth of the human arterial system. Invading colonies of bacteria advance relentlessly and you must destroy as many as you can. If you fail to keep the bacteria count low they attack individual organs. You must then frantically follow the network of arteries to reach the site of infection. Too many critical areas and you die.

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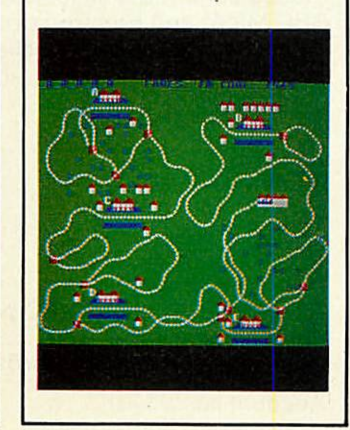
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The game has excellent graphics and will keep you on your toes. See how profitably you can run a railway.

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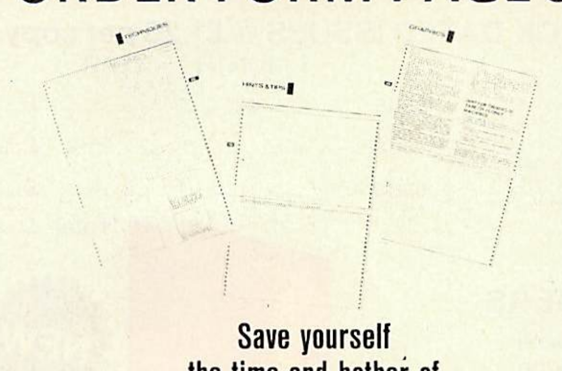


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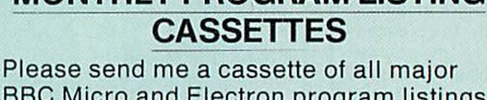
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See 'Box of Tricks', page 72

Rob Fenton's Paintbox listing

```
   1 REM Paintbox
   2 REM by Robert Fenton
   3 REM for BBC and Electron
   4 REM (c) Acorn User - Feb.1984
   5 :
  10 DIM XST%(2),YST%(2)
  20 *FX18
  30 *TV255,1
  40 *OPT1
  50 *KEY10 O.|L|MRUN|L|M
  60 DIM CP% 8
  70 *FX4,2
  80 MODE2:VDU23;8202;0;0;0;
  90 PROCSETVARS
 100 PROCMENU
 110 REPEAT
 120 PROCKEY
 130 PROCCUR
 140 IFL%=0 PROCCHECK
 150 IFL%=-1 PROCRCHECK
 160 UNTIL FALSE
 165 :
 170 DEF PROCSETVARS
 180 M%=1023-12
 190 K=5
 200 V=0:H=0
 210 C%=7
 220 X%=640:Y%=512
 230 L%=0:XS%=X%:YS%=Y%
 240 BACK=0
 250 M1%=1:M2%=2
 260 IC%=16
 270 CX=48:CY=48
 280 ENDPROC
 285 :
 290 DEFPROCKEY
 300 *FX21
 310 IFINKEY-51 PLOT69,X%,Y%
 320 IFINKEY-56 PLOT&4D,X%,Y%
 330 IFINKEY-106 PROCCOPYS
 340 IFINKEY-90 PROCDUMPS
 350 IFINKEY-55 L%=NOT L%
 360 IFINKEY-68 PROCRUB
 370 IFINKEY-82 ANDINKEY-1 PROCSAVE
 380 IFINKEY-87 ANDINKEY-1 PROCLOAD
 390 IFINKEY-57 ANDIC%>4 IC%=IC%-4
 400 IFINKEY-33 PROCSQR
 410 IFINKEY-114 PROCCIRC
 420 IFINKEY-115 PROCH
 430 IFINKEY-116 PROCFILL
 440 IFINKEY-21 PROCAIRBRUSH
 450 IFINKEY-117 PROCMIX
 460 IFINKEY-118 PROCWIPE
 470 IFINKEY-23 K=5
 480 IFINKEY-119 K=85
 490 IFINKEY-120 K=21
 500 IFINKEY-89 IC%=IC%+4
 510 IFINKEY-100 V=NOT(V)
 520 IFINKEY-85 H=NOT(H)
 530 IFINKEY-58 Y%=Y%+IC%
 540 IFINKEY-42 Y%=Y%-IC%
 550 IFINKEY-26 X%=X%-IC%
 560 IFINKEY-122 X%=X%+IC%
 570 IFINKEY-24 IC%=4
 580 IFINKEY-88 IC%=8
 590 IFINKEY-73 IC%=16
 600 IFINKEY-103 ANDCX>0 CX=CX-4
 610 IFINKEY-104 CX=CX+4
 620 IFINKEY-98 ANDCY>0 CY=CY-4
 630 IFINKEY-66 CY=CY+4
 640 *FX202,32
 650 ENDPROC
 655 :
 660 DEFPROCCUR
 670 GCOL3,7
 680 FORI%=1TO2:*FX19
 690 IFL% MOVEXS%,YS%:DRAWX%,Y%:GOTO760
 700 IFS%=6 ANDL% MOVEX%,Y%:DRAWXS%,YS%
:GOTO780
 710 MOVEX%-12,Y%:DRAWX%+12,Y%:MOVEX%,Y
%-12:DRAWX%,Y%+12
 720 PLOT69,X%+CX,Y%+CY
 730 PLOT69,X%+CX,Y%-CY
 740 PLOT69,X%-CX,Y%-CY
 750 PLOT69,X%-CX,Y%+CY
 760 IFV MOVEX%,0:DRAWX%,M%
 770 IFH MOVE0,Y%:DRAW1279,Y%
 780 NEXT
 790 GCOL0,C%
 800 ENDPROC
 805 :
 810 DEFPROCCHECK
 820 IFY%>1023 Y%=0
 830 IFY%<0 Y%=1023
 840 IFX%<0 X%=1279
 850 IFX%>1279 X%=0
 860 IFY%>M% ANDINKEY-1 PROCCOL
 870 ENDPROC
 875 :
 880 DEFPROCSQR
 890 MOVEX%-CX,Y%-CY:MOVEX%-CX,Y%-CY:PL
OTK,X%-CX,Y%+CY:PLOTK,X%+CX,Y%+CY:PLOTK,
X%+CX,Y%-CY:PLOTK,X%-CX,Y%-CY
 900 ENDPROC
 905 :
 910 DEFPROCCIRC
 920 VDU29,X%;Y%;
 930 LOCALX,Y
 940 INC=.4
 950 EX=CY/CX
 960 MOVEX+CX,Y:MOVEX+CX,Y
 970 FORT=0 TO2*PI STEPINC
 980 IFK=85 MOVEX+CX,Y
 990 PLOTK,CX*COS(T)+X,CX*EX*SIN(T)+Y
1000 NEXT
1010 PLOT5,X+CX,Y
1020 VDU29,0;0;
1030 ENDPROC
1035 :
1040 DEFPROCFILL
1050 IFPOINT(X%,Y%)<>BACK ENDPROC
1060 PROCFIND(X%,Y%)
1065 :
1070 GCOL0,M1%
1080 MOVELX,Y%:PLOT21,RX,Y%
1090 GCOL0,M2%
1100 MOVELX+8,Y%:PLOT21,RX,Y%
1110 GCOL0,C%
1120 ENDPROC
1125 :
1130 DEFPROCFIND(X,Y)
1140 PLOT76,X,Y:LOCALX%,Y%,A%
1150 X%=CP% MOD256
1160 Y%=CP% DIV256
1170 A%=&D
1180 CALL&FFF1
1190 LX=!CP% AND&FFFF
1200 RX=!(CP%+4) AND&FFFF
1210 ENDPROC
1215 :
1220 DEFPROCMIX
1230 PROCGET(-2,0,1279,M%,1023)
1240 SOUND3,-15,100,3
1250 M1%=POINT(X%,Y%)
```

Continued ▶

◀Continued

```
1260 PROCGET(-1,0,1279,M%,1023)
1270 SOUND3,-15,100,3
1280 M2%=POINT(X%,Y%)
1290 Y%=M%-4
1300 ENDPROC
1305 :
1310 DEFPROCGET(N,NX,NY,MX,MY)
1320 REPEAT
1330 PROCKEY2:PROCCUR
1340 IFX%<NX X%=NY
1350 IFX%>NY X%=NX
1360 IFY%<MX Y%=MY
1370 IFY%>MY Y%=MX
1380 UNTILINKEY N
1390 ENDPROC
1395 :
1400 DEFPROCWIPE
1410 GCOL0,C%+128:BACK=C%
1420 CLG
1430 C%=7
1440 PROCMENU
1450 ENDPROC
1455 :
1460 DEFPROCRUB
1470 IFINKEY-1 L%=NOT(L%):ENDPROC
1480 IFL% MOVEX%,Y%:DRAWXS%,YS%
1490 XS%=X%:YS%=Y%
1500 ENDPROC
1505 :
1510 DEFPROCH
1520 GCOL0,M1%:PLOT&4D,X%,Y%
1530 GCOL0,M2%:PLOT&4D,X%,Y%+4
1540 ENDPROC
1545 :
1550 DEFPROCAIRBRUSH
1560 FORI%=Y%-CY TOY%+CY STEPIC%
1570 FORJ%=X%-CX TOX%+CX STEPIC%
1580 IFRND(10)<5 PLOT69,J%,I%
1590 NEXT,
1600 ENDPROC
1605 :
1610 DEFPROCRCHECK
1620 IFX%>1279 X%=1279
1630 IFX%<0 X%=0
1640 IFY%>1023 Y%=1023
1650 IFY%<0 Y%=0
1660 IFY%>M% ANDINKEY-1 PROCCOL
1670 ENDPROC
1675 :
1680 DEFPROCLOAD
1690 *L.SCREEN 3000
1700 PROCMENU
1710 ENDPROC
1715 :
1720 DEFPROCSAVE
1730 *S.SCREEN 3000 7FFF
1740 ENDPROC
1745 :
1750 DEFPROCMENU
1760 RESTORE
1770 FORI%=0TO7
1780 READC:GCOL0,C
1790 XM%=I%*140:XT%=(I%*140)+140
1800 MOVEXM%,1023:DRAWXT%,1023:PLOT85,X
T%,M%:PLOT85,XM%,M%:PLOT85,XM%,1023
1810 NEXT
1820 GCOL0,7
1830 M%=M%-4
1840 MOVE0,M%:DRAW1279,M%
1850 PROCBLOCK(7)
1860 M%=M%+4
1870 ENDPROC
1880 DATA7,3,6,2,5,1,4,0,
1885 :
1890 DEFPROCCOL
1900 C=C%
1910 IFX%<XT% C%=POINT(X%,Y%)
1920 IFC<>C% SOUND3,-13,100,2
1930 PROCBLOCK(C%)
1940 ENDPROC
1945 :
1950 DEFPROCBLOCK(C%)
1960 GCOL0,C%
1970 MOVEXT%,1023:DRAW1279,1023
1980 PLOT85,1279,M%:PLOT85,XT%,M%
1990 PLOT85,XT%,1023
2000 ENDPROC
2005 :
2010 DEFPROCKEY2
2020 IFINKEY-58 Y%=Y%+IC%
2030 IFINKEY-42 Y%=Y%-IC%
2040 IFINKEY-26 X%=X%-IC%
2050 IFINKEY-122 X%=X%+IC%
2060 ENDPROC
2070 DEFPROCCOPYS
2080 XST%(1)=X%
2090 XST%(2)=Y%
2100 YST%(1)=CX
2110 YST%(2)=CY
2120 ENDPROC
2125 :
2130 DEFPROCDUMPS
2140 LOCALM%,N%,CX,CY
2150 M%=XST%(1)
2160 N%=XST%(2)
2170 CX=YST%(1)
2180 CY=YST%(2)
2190 FORI%=-CY TOCY STEP4
2200 FORJ%=-CX TOCX STEP4
2210 GCOL0,POINT(M%+J%,N%+I%):PLOT69,X%
+J%,Y%+I%
2220 NEXT,
2230 ENDPROC
```

ELECTRON

CONVERSION NOTES

Paintbox will run on the Electron. Because of the different function key layout on the Elk, readers should make the changes listed below to the program. This will allow the keys 0-9 inclusive to be used in place of the corresponding function keys.

```
400 IFINKEY-40 PROCSQR
410 IFINKEY-49 PROCCIRC
420 IFINKEY-50 PROCH
430 IFINKEY-18 PROCFILL
440 IFINKEY-19 PROCAIRBRUSH
450 IFINKEY-20 PROCMIX
460 IFINKEY-53 PROCWIPE
470 IFINKEY-37 K=5
480 IFINKEY-22 K=85
490 IFINKEY-39 K=21
```

See 'Charting Success', page 77

Listing 1. Peter Sandford's pie chart plotting routines

```
   10 REM PIES
   20 REM Peter Sandford
   30 REM For BBC and Elk
   40 REM (C) Acorn User XXXXX
   50 :
   60 IF PAGE<>&1500 THEN PAGE=&1500:CHAIN"PIES"
   70 dotfill=&1200:*LOAD DOTFILL 1200
   80 MODE 0
   90 PROCinit
  100 ON ERROR PROCerror
  110 REPEAT
  120 CLS:PRINTTAB(21)"PIE CHART PLOTTER - ENTER OPTION (1-5)"
  130 PRINT"1) DRAW PIE CHART  2) DRAW LABEL  3) LOAD SCREEN  4) SAVE SCREEN  5) SCREENDUMP";
  140 K%=(GET OR &10)-48
  150 CLS
  160 IF K%=1 PROCpie
  170 IF K%=2 PROClabel
  180 IF K%=3 PROCload
  190 IF K%=4 PROCsave
  200 IF K%=5 PROCdump
  210 UNTIL FALSE
  220 END
  230 :
  240 DEF PROCerror
  250 PROCwindow(0):VDU4:CLS:REPORT
  260 IF ERR<45 AND ERR<>17 THEN PRINT" at line ";ERL;
  270 PRINT" ... Press 'Q' to quit, any other key to continue";
  280 K%=GET AND &DF:PRINT
  290 IF K%=81 VDU23,48,60,102,110,126,118,102,60,0:END
  300 ENDPROC
  310 :
  320 DEFPROCinit
  330 PROCwindow(0):PROCcursoroff
  340 MOVE 0,65:DRAW 0,1023:DRAW 1279,1023:DRAW 1279,65:DRAW 0,65
  350 MOVE 952,65:DRAW 952,1023
  360 PROCwindow(1)
  370 cx=480:cy=875
  380 DIM osblock 30,data(5),tone%(5),label$(5)
  390 FOR J%=1 TO 5:label$(J%)=STRING$(25," "):NEXT
  400 A$=STRING$(60," "):an$=A$:mess$=STRING$(79," "):L$=STRING$(25," ")
  410 VDU 23,48,60,102,102,102,102,102,60,0
  420 ENDPROC
  430 :
  440 DEF PROCwindow(w)
  450 IF w=0 VDU 28,0,31,79,30
  460 IF w=1 VDU 24,8;72;944;1016;
  470 IF w=2 VDU 24,960;72;1272;1016;
  480 IF w=3 VDU 24,8;72;1272;1016;
  490 ENDPROC
  500 :
  510 DEF PROCmovecursor
  520 PROCwindow(3):PROCcursor(cx,cy)
  530 CLS:PRINT SPC(4)"Use CURSOR KEYS to position cursor, & press RETURN when ready to proceed"
  540 PRINTTAB(24,1)"Cursor position (X,Y): ";cx;TAB(51,1)",";cy;
  550 xs=2:ys=4
  560 REPEAT
  570 ox=cx:oy=cy
  580 cx=cx+xs*INKEY(-26)-xs*INKEY(-122)
  590 cy=cy+ys*INKEY(-42)-ys*INKEY(-58)
  600 IF cx<8 OR cx>1272 cx=ox
  610 IF cy<72 OR cy>1016 cy=oy
  620 IF ox<>cx THEN xs=xs+2
  630 IF oy<>cy THEN ys=ys+4
  640 IF ox=cx AND oy=cy THEN xs=2:ys=4 ELSE PROCcursor(ox,oy):PROCcursor(cx,cy):PRINTTAB(47,1);"     ,     "TAB(47,1);cx;TAB(52,1);cy;
  650 UNTIL INKEY(-74)
  660 PROCcursor(cx,cy)
  670 IF cx<952 THEN PROCwindow(1) ELSE PROCwindow(2)
  680 CLS
  690 ENDPROC
  700 :
  710 DEF PROCcursor(x%,y%)
  720 MOVE x%-32,y%:PLOT 2,64,0
  730 PLOT 0,-32,-32:PLOT 2,0,64
  740 ENDPROC
  750 :
  760 DEF PROCsave
  770 F$=FNinputstr("FILENAME ",12)
  780 PROCoscli("*SAVE """+F$+""" 3000 7B00")
  790 ENDPROC
  800 :
  810 DEF PROCload
  820 F$=FNinputstr("FILENAME ",12)
  830 PROCoscli("*LOAD """+F$+""" 3000")
  840 ENDPROC
  850 :
  860 DEF PROCoscli(A$)
  870 X%=osblock:Y%=osblock DIV 256
  880 $osblock=A$:CALL &FFF7
  890 ENDPROC
  900 :
  910 DEF PROCdump
  920 CLS:VDU 26
  930 REM Insert CALL to screen dump here
  940 PROCwindow(0):PROCwindow(3)
  950 ENDPROC
  960 :
  970 DEF PROClabel
  980 PROCmovecursor:PROCcursor(cx,cy)
  990 cur$=FNget("Print text FROM cursor (F), or CENTRE text at cursor (C) ?","FC")
 1000 M%=VAL(FNget("Select label mode: 1) Background deleted 2) Background retained 3) Underlining","123"))
 1010 A$=FNinputstr("Enter label",60)
 1020 L%=LEN(A$)
 1030 PROCcursor(cx,cy)
 1040 IF cur$="F" MOVE cx,cy+32 ELSE MOVE cx-16*(L%/2),cy+32
 1050 VDU 5
 1060 IF M%=1 PRINT STRING$(L%,CHR$(9))+STRING$(L%,CHR$(127));
 1070 PRINT A$;
 1080 IF M%=3 THEN PLOT 0,0,-4:PRINT STRING$(L%,CHR$(8))+STRING$(L%,"_")
 1090 VDU 4
 1100 ENDPROC
 1110 :
 1120 DEF FNget(mess$,in$)
 1130 PROCcursoron
 1140 PROCmessage
 1150 *FX 15,1
```

Continued ▶

◀ *Continued*

```
1160 REPEAT
1170 K%=GET
1180 IF K%>96 AND K%<123 K%=K% AND &DF
1190 IF K%>32 AND K%<42 K%=K% OR &10
1200 an$=CHR$(K%)
1210 UNTIL FNinstr(in$,an$)
1220 CLS:PROCcursoroff
1230 =an$
1240 :
1250 DEF FNinput(mess$,low,high)
1260 PROCcursoron
1270 PROCmessage
1280 *FX 15,1
1290 INPUT,value
1300 IF value<low OR value>high THEN VD
U 7:GOTO 1270
1310 CLS:PROCcursoroff
1320 =value
1330 :
1340 DEF FNinputstr(mess$,len)
1350 PROCcursoron
1360 PROCmessage:PRINT
1370 *FX 15,1
1380 INPUTLINE TAB(40-len/2),an$
1390 IF LEN(an$)>len THEN VDU 7:GOTO 13
60
1400 CLS:PROCcursoroff
1410 =an$
1420 :
1430 DEF PROCmessage
1440 CLS
1450 PRINTTAB(40-LEN(mess$)/2);mess$;
1460 ENDPROC
1470 :
1480 DEF PROCcursoron
1490 VDU 23,1,1;0;0;0;
1500 ENDPROC
1510 :
1520 DEF PROCcursoroff
1530 VDU 23,1,0;0;0;0;
1540 ENDPROC
1550 :
1560 DEF FNinstr(A$,B$)
1570 IF LEN(A$)<LEN(B$) THEN =0
1580 =INSTR(A$,B$)
1590 :
1600 DEF PROCkey(L$,P%,T%)
1610 PROCwindow(2)
1620 x%=968:y%=900-80*P%
1630 MOVE x%,y%:PLOT 1,0,40:PLOT 1,40,0
:PLOT 1,0,-40:PLOT 1,-40,0
1640 PROCfill(x%+20,y%+20,T%)
1650 VDU 5:PROCdrawlabel:VDU 4
1660 PROCwindow(1)
1670 ENDPROC
1680 :
1690 DEF PROCdrawlabel
1700 MOVE 1024,934-80*P%
1710 IF LEN(L$)<16 THEN PRINT L$:ENDPRO
C
1720 IF FNinstr(LEFT$(L$,15)," ")=FALSE
 THEN ENDPROC
1730 L%=16:REPEAT:L%=L%-1:UNTIL MID$(L$
,L%,1)=" "
1740 PLOT 0,0,16:PRINT LEFT$(L$,L%-1)+S
TRING$(L%-1,CHR$(8))+CHR$(10)+RIGHT$(L$,
LEN(L$)-L%)
1750 ENDPROC
1760 :
1770 DEF PROCfill(x%,y%,tone%)
1780 CALL dotfill,x%,y%,tone%
1790 ENDPROC
1800 :
1810 DEF PROCinittones
1820 RESTORE 1850
1830 FOR J%=1 TO 5
1840 READ tone%(J%):NEXT
1850 DATA 9,2,5,4,3
1860 ENDPROC
1870 :
1880 DEF PROCpie
1890 LOCAL P%,S%
1900 PROCwindow(2):CLG
1910 PROCwindow(1):CLG
1920 pies=FNinput("Number of pies (1-4)
",1,4)
1930 segs=FNinput("Number of segments f
or each pie (5 max)",1,5)
1940 ht$=FNget("Do you want automatic s
election of hatch tones (Y/N)?","YN")
1950 IF ht$="Y" PROCinittones
1960 FOR S%=1 TO segs
1970 label$(S%)=FNinputstr("Title for s
egment "+STR$(S%)+" (max 25 letters) ",2
5)
1980 IF ht$="N" tone%(S%)=FNinput("Hatc
h tone for segment "+STR$(S%)+" (0 to 23
) ",0,23)
1990 PROCkey(label$(S%),S%,tone%(S%))
2000 NEXT
2010 pc$=FNget("Do you want segments la
belling as percentages (Y/N) ?","YN")
2020 IF pies=1 r=175 ELSE r=120
2030 FOR P%=1 TO pies
2040 IF pies=1 xc=480
2050 IF pies=2 xc=240-480*(P%=2)
2060 IF pies=3 xc=480+240*(P%=2)-240*(P
%=3)
2070 IF pies=4 xc=240-480*(P%MOD2=0)
2080 IF pies<3 yc=500 ELSE yc=675+375*(
pies-P%<2)
2090 total=0
2100 FOR S%=1 TO segs
2110 data(S%)=FNinput("PIE "+STR$(P%)+"
: DATA for "+label$(S%)+" ",0,1E9)
2120 total=total+data(S%)
2130 NEXT S%
2140 scale=2*PI/total
2150 a1=0
2160 FOR S%=1 TO segs
2170 a2=a1+scale*data(S%):a3=(a1+a2)/2
2180 x=xc:y=yc
2190 ex$=FNget("Do you want to 'explode
' segment "+STR$(S%)+" ("+label$(S%)+")
(Y/N)?","YN")
2200 IF ex$="Y" THEN x=xc+(r/5)*SIN(a3)
:y=yc+(r/5)*COS(a3)
2210 GCOL 0,1
2220 MOVE x,y
2230 DRAW x+r*SIN(a1),y+r*COS(a1)
2240 FOR arc=a1 TO a2 STEP PI/50
2250 DRAW x+r*SIN(arc),y+r*COS(arc)
2260 NEXT arc
2270 DRAW x+r*SIN(a2),y+r*COS(a2)
2280 DRAW x,y
2290 PROCfill(x+(r/2)*SIN(a3),y+(r/2)*C
OS(a3),tone%(S%))
2300 IF pc$="Y" THEN PROCpercent
2310 a1=a2
2320 NEXT S%
2330 NEXT P%
2340 ENDPROC
2350 :
2360 DEF PROCpercent
2370 A$=STR$(INT(data(S%)/total*100+0.5
))+"%"
2380 MOVE x+(r+8+8*LEN(A$))*SIN(a3)-8*L
EN(A$),y+(r+32)*COS(a3)+16
2390 VDU 5:PRINT A$:VDU 4
2400 ENDPROC
```

Listing 2. Bar chart plotting routines

```
   10 REM BARS
   20 REM Peter Sandford
   30 REM For BBC and Elk
   40 REM (C) Acorn User XXXX
   50 :
   60 IF PAGE<>&1500 THEN PAGE=&1500:CHA
IN"BARS"
  120 CLS:PRINTTAB(16)"BARCHART PLOTTING
 UTILITY - ENTER OPTION (1-5)"
  130 PRINT" 1) DRAW BARCHART  2) DRAW L
ABEL  3) LOAD SCREEN  4) SAVE SCREEN  5)
 SCREENDUMP";
  160 IF K%=1 PROCbars
 1850 DATA 9,2,5,4,3
 1880 DEF PROCbars
 1890 PROCwindow(2):CLG
 1900 PROCwindow(1):CLG
 1910 ymax=FNinput("Maximum value for ve
rtical axis ",0,1E6)
 1920 ints=FNinput("Number of intervals
to be marked on vertical axis ",1,20)
 1930 vscale=600/ymax
 1940 PROCdrawaxes
 1950 bars=FNinput("Number of bars (1-20
)",1,20)
 1960 divs=FNinput("Number of subdivisio
ns for each bar (1-5) ",1,5)
 1970 ht$=FNget("Do you want automatic s
election of hatch tones (Y/N)","YN")
 1980 PROCinittones
 1990 FOR S%=1 TO divs
 2000 label$(S%)=FNinputstr("Title for s
ubdivision "+STR$(S%)+" (max 25 letters)
 ",25)
 2010 IF ht$="N" tone%(S%)=FNinput("Hatc
h tone for subdivision "+STR$(S%)+" (0-2
3)",0,23)
 2020 PROCkey(label$(S%),1+divs-S%,tone%
(S%))
 2030 NEXT
 2040 width=750/bars
 2050 FOR bar=1 TO bars
 2060 xbase=150+width*(bar-1)+width/2
 2070 ybase=200
 2080 FOR S%=1 TO divs
 2090 height=vscale*FNinput("BAR "+STR$(
bar)+" : DATA for subdivision "+STR$(S%)
+" ("+label$(S%)+") ",0,ymax*1.2)
 2100 PROCdrawbar(xbase,ybase,height,wid
th/2,tone%(S%))
 2110 ybase=ybase+height
 2120 NEXT S%
 2130 NEXT bar
 2140 ENDPROC
 2150 :
 2160 DEF PROCdrawbar(x,y,h,w,t%)
 2170 MOVE x,y:MOVE x,y+h
 2180 PLOT 87,x+w,y:PLOT 87,x+w,y+h
 2190 DRAW x+w,y:DRAW x,y
 2200 DRAW x,y+h:DRAW x+w,y+h
 2210 MOVE x+2,y:DRAW x+2,y+h
 2220 MOVE x+w-2,y:DRAW x+w-2,y+h
 2230 PROCfill(x+w/2,y+h/2,t%)
 2240 ENDPROC
 2250 :
 2260 DEF PROCdrawaxes
 2270 MOVE 150,800
 2280 DRAW 150,200:DRAW 920,200
 2290 FOR val=0 TO ymax STEP ymax/ints
 2300 y=200+val*vscale
 2310 MOVE 138,y:DRAW 150,y
 2320 VDU 5
 2330 FOR x=152 TO 920 STEP 8
 2340 PLOT 69,x,y
 2350 NEXT
 2360 A$=STR$(INT(val+0.5))
 2370 IF LEN(A$)>3 A$=LEFT$(A$,LEN(A$)-3
)+","+RIGHT$(A$,3)
 2380 MOVE 134-16*LEN(A$),y+16
 2390 PRINT A$
 2400 NEXT val
 2410 VDU 4
 2420 ENDPROC
```

Listing 3. Alternative version of PROCbars

```
 1880 DEF PROCbars
 1890 PROCwindow(2):CLG
 1900 PROCwindow(1):CLG
 1910 ymax=FNinput("Maximum value for ve
rtical axis ",0,1E6)
 1920 ints=FNinput("Number of intervals
to be marked on vertical axis ",1,20)
 1930 vscale=600/ymax
 1940 PROCdrawaxes
 1950 sets=FNinput("How many sets of bar
s (1-12)",1,12)
 1960 maxbars=INT(24/sets):IF maxbars>5
maxbars=5
 1970 nbars=FNinput("How many bars in ea
ch set (1-"+STR$(maxbars)+")",1,maxbars)
 1980 ht$=FNget("Do you want automatic s
election of hatch tones (Y/N)","YN")
 1990 PROCinittones
 2000 FOR B%=1 TO nbars
 2010 label$(B%)=FNinputstr("Title for b
ar "+STR$(B%)+" (max 25 letters) ",25)
 2020 IF ht$="N" tone%(B%)=FNinput("Hatc
h tone for bar "+STR$(B%)+" (0-23)",0,23
)
 2030 PROCkey(label$(B%),B%,tone%(B%))
 2040 NEXT
 2050 width=750/(sets*(nbars+1))
 2060 xbase=150:ybase=200
 2070 FOR set=1 TO sets:xbase=xbase+widt
h
 2080 FOR bar=1 TO nbars
 2090 height=vscale*FNinput("SET "+STR$(
set)+" : DATA for bar "+STR$(bar)+" ("+l
abel$(bar)+") ",0,ymax*1.2)
 2100 PROCdrawbar(xbase,ybase,height,wid
th,tone%(bar))
 2110 xbase=xbase+width
 2120 NEXT bar
 2130 NEXT set
 2140 ENDPROC
```

Listing 4 ▶

Listing 1. The basic database program

All versions of the database programs described in Hints and Tips can be easily adapted from the program presented in listing 1. All you need do in each case is to add or delete certain lines to the current listing. Thus version 2 is arrived at by amending listing 1; version 3 by amending version 2 etc.

IMPORTANT: The OPENUP command used in these programs is found only in Basic 2. If you have Basic 1 you *must* change this to OPENIN.

```
   10 REM Simple database version 1
   20 REM Martin Phillips
   30 REM (c) Acorn User February 1985
   40 REM Electron & BBC Micro
   50 :
   60 MODE6
   70 PROCinitialise
   80 PROCmenu
   90 END
  100 :
  110 DEFPROCinitialise
  120 VDU19,0,4,0,0,0
  130 DIM name$(100)
  140 DIM address$(100)
  150 DIM tele$(100)
  160 A%=0
  170 ENDPROC
  180 :
  190 DEFPROCmenu
  200 REPEAT
  210 CLS
  220 PRINTTAB(18,1)"MENU"
  230 PRINTTAB(5,4)"1 Input records"
  240 PRINTTAB(5,7)"2 Load records"
  250 PRINTTAB(5,10)"3 Save records"
  260 PRINTTAB(5,13)"4 Look at records"
  270 PRINTTAB(5,16)"5 End"
  280 PRINTTAB(5,22)"Enter choice ";
  290 A=GET-48
  300 IF A=1 THEN PROCinput
  310 IF A=2 THEN PROCload
  320 IF A=3 THEN PROCsave
  330 IF A=4 THEN PROClook
  340 UNTIL A=5
  350 CLS
  360 ENDPROC
  370 :
  380 DEFPROCinput
  390 IF A%=100 THEN GOTO 490
  400 REPEAT
  410 A%=A%+1
  420 CLS
  430 PRINTTAB(13,1)"ENTER RECORDS"'
  440 INPUTLINE"Enter name:"'name$(A%)
  450 INPUTLINE"Enter address:"'address$
(A%)
  460 INPUTLINE"Enter telephone number:"
'tele$(A%)
  470 INPUT"Enter another record (Y/N)?
"A$
  480 UNTIL A$="N" OR A$="n" OR A%=100
  490 ENDPROC
  500 :
  510 DEFPROCload
  520 CLS
  530 PRINTTAB(14,1)"LOAD RECORDS"'
  540 IF A%=0 THEN GOTO 580
  550 PRINT"ARE YOU SURE (Y/N)?"
  560 IF GET$<>"Y" THEN GOTO 660
  570 A%=0
  580 X=OPENUP("ADDBOOK")
  590 REPEAT
  600 A%=A%+1
  610 INPUT #X,name$(A%)
  620 INPUT #X,address$(A%)
  630 INPUT #X,tele$(A%)
  640 UNTIL EOF#X
  650 CLOSE #X
  660 ENDPROC
  670 :
  680 DEFPROCsave
  690 CLS
  700 PRINTTAB(14,1)"SAVE RECORDS"'
  710 IF A%=0 THEN GOTO 790
  720 X=OPENOUT("ADDBOOK")
  730 FOR N=1 TO A%
  740 PRINT #X,name$(N)
  750 PRINT #X,address$(N)
  760 PRINT #X,tele$(N)
  770 NEXT N
  780 CLOSE #X
  790 ENDPROC
  800 :
  810 DEFPROClook
  820 CLS
  830 PRINTTAB(14,1)"ADDRESS BOOK"'
  840 IF A%>0 THEN GOTO 880
  850 PRINT"There are no records to see"
  860 PRINT"Press space bar"
  870 REPEAT UNTIL GET=32:GOTO 980
  880 FOR N=1 TO A%
  890 CLS
  900 PRINTTAB(14,1)"ADDRESS BOOK"'
  910 PRINT"Record ";N''
  920 PRINTname$(N)
  930 PRINTaddress$(N)
  940 PRINTtele$(N)
  950 PRINTTAB(5,23)"Press space bar";
  960 REPEAT UNTIL GET=32
  970 NEXT
  980 ENDPROC
```

Listing 4. General-purpose shape-filling procedures

```
   10 REM FILL utility
   20 REM Peter Sandford
   30 REM For BBC and Elk
   40 REM (C) Acorn User XXXX
   50 :
   60 :
  120 CLS:PRINTTAB(23)"FILL UTILITY - EN
TER OPTION (1-5)"
  130 PRINT" 1) FILL FROM CURSOR 2) DRAW
 LABEL 3) LOAD SCREEN 4) SAVE SCREEN 5)
SCREENDUMP";
  160 IF K%=1 PROCshapefill
  370 cx=480:cy=875:keypos=1
 1810 DEF PROCshapefill
 1820 PROCwindow(1)
 1830 tone%=FNinput("Select hatch tone (
0-23) ",0,23)
 1840 IF FNget("Do you want to draw a ti
tle for this tone (Y/N)?","YN")="Y" THEN
 PROCkeytitle
 1850 REPEAT
 1860 cx=480:cy=875
 1870 PROCmovecursor
 1880 PROCfill(cx,cy,tone%)
 1890 UNTIL FNget("Do you want to fill a
nother area with this tone (Y/N)?","YN")
="N"
 1900 ENDPROC
 1910 :
 1920 DEF PROCkeytitle
 1930 A$=FNinputstr("Enter title (max 25
 characters) ",25)
 1940 PROCkey(A$,keypos,tone%)
 1950 keypos=keypos+1
 1960 ENDPROC
```

See 'RAF to the Rescue' page 82

```
   10 REM RAF - Making the header
   20 REM by Joe Telford
   30 REM for BBC with discs
   40 REM (c) Acorn User - Feb.1985
   50 :
  100 name$="D.heading"
  110 IF OPENIN(name$)=0 PROCsave(name$)
:END
  120 PRINT'''"File: "name$" : exists."
  130 PRINT'"Please change disk then rer
un."
  140 CLOSE#0:*DR.0
  150 END
 1000 DEFPROCsave(name$)
 1010 channel= OPENOUT(name$)
 1020 READ records:PRINT#channel,records
 1030 FOR record = 1 TO records
 1035 READ fieldname$,size
 1040 PRINT#channel,fieldname$,size
 1050 NEXT
 1060 CLOSE#channel
 1070 PRINT"done"
 1080 ENDPROC
 2000 DATA 12,recno,3,Surname,20,Forenam
es,20
 2010 DATA Sex,1,Parent,20
 2020 DATA YOB,2,MOB,2,DOB,2,Address Lin
e 1,20
 2030 DATA Address Line 2,20,Address Lin
e 3,20,Phone,11
```

Listing 1. Skeleton for the heading program

```
   10 REM RAF - Make RAF
   20 REM by Joe Telford
   30 REM for BBC with discs
   40 REM (c) Acorn User - Feb.85
   50 :
  100 ON ERROR REPORT:PRINT"at";ERL:CLOSE
#0:END
  110 PROCload("d.heading")
  120 CLS:PRINT'"Creating Random access f
ile ";
  130 name$="D.roll":PRINTname$
  140 PROCcreatefile(name$,30)
  150 PRINT''"done":*DR.0
  160 END
 2000 DEFPROCload(name$):REM LOADHDR
 2010 LOCALchannel,field
 2020 channel=OPENIN(name$)
 2030 INPUT#channel,fields
 2040 DIM fieldname$(fields),size(fields)
 2050 FOR field = 1 TO fields
 2060 INPUT#channel,fieldname$(field),siz
e(field)
 2070 NEXT
 2080 CLOSE#channel
 2090 ENDPROC
10200 DEF PROCcreatefile(name$,records)
10210 LOCALchannel,record,field
10220 channel=OPENOUT(name$)
10230 FOR record=1 TO records:PRINTrecord
s-record:VDU11
10240 FOR field=1 TO fields
10250 PRINT#channel,STRING$(size(field),"
 ")
10260 NEXT,
10270 CLOSE#channel
10280 ENDPROC
```

Listing 2. Constructs an RAF using the heading program

```
   10 REM RAF - Enter RAF
   20 REM by Joe Telford
   30 REM for BBC with discs
   40 REM (c) Acorn User - Feb.85
   50 :
  100 ONERROR REPORT:CLOSE#0:END
  110 PROCload("d.heading")
  120 DIMfield$(fields)
  130 reclength=FNsize
  140 name$="D.roll"
  150 channel=OPENUP(name$)
  160 REPEAT
  170 no=FNwhichrecord(reclength)
  180 PROCgetrecord(no)
  190 PROCwriterecord(no,reclength)
  200 UNTIL FNok("Another record? Y/N")="
N"
  210 CLOSE#channel
  220 PRINT''"done":*DR.0
  230 END
 2000 DEFPROCload(name$)
 2010 LOCALchannel,field
 2020 channel=OPENIN(name$)
 2030 INPUT#channel,fields
 2040 DIM fieldname$(fields),size(fields)
 2050 FOR field = 1 TO fields
 2060 INPUT#channel,fieldname$(field),siz
e(field)
 2070 NEXT
 2080 CLOSE#channel
 2090 ENDPROC
 3100 DEF FNsize
 3110 LOCALfield,len:len=0
 3120 FOR field = 1 TO fields
 3130 len=len+size(field)+2
 3140 NEXTfield
 3150 =len
 3200 DEF FNwhichrecord(reclength)
 3210 LOCALrecno
 3220 REPEAT
 3230 CLS:PRINT"File: "name$
 3240 PRINT'fieldname$(1)" (";size(1);" c
hars) ";
 3250 INPUT "> "recno
 3260 UNTILrecno>-1 AND (recno*reclength+
reclength) <=EXT#channel
 3270 =recno
 4000 DEF PROCgetrecord(no)
 4010 LOCALfield
 4020 REPEAT:CLS:PRINT"File: "name$
 4030 PRINT'fieldname$(1)" (";size(1);")
chars.";no
 4040 field$(1)=STR$(no)+STRING$(size(1)-
LEN(STR$(no))," ")
 4050  FORfield= 2 TO fields
 4060 PRINT'fieldname$(field)" (";size(fi
eld);") chars.";
 4070 INPUTfield$(field)
 4080 field$(field) = field$(field)+ STRI
NG$(size(field)- LEN(field$(field)) ," ")
 4090 NEXTfield
 4100 UNTIL FNok("Any errors? Y/N")="N"
 4110 ENDPROC
 4120 DEF PROCwriterecord(no,reclength)
 4130 LOCALfield
 4140 PTR#channel=no*reclength
 4150 FORfield= 1 TO fields
 4160 PRINT#channel,field$(field)
 4170 NEXTfield
 4180 ENDPROC
11000 DEF FNok(X$)
11010 LOCAL an$
11020 PRINT'X$
11030 *FX21,0
11040 REPEAT an$=GET$:UNTILan$="Y" OR an$
="N"
11050 =an$
```

Listing 3. Enters the random access file

```
   10 REM RAF - Print RAF
   20 REM by Joe Telford
   30 REM for BBC with discs
   40 REM (c) Acorn User - Feb.85
   50 :
  100 ONERROR REPORT:CLOSE#0:END
  110 MODE3
  120 PROCload("d.heading")
  130 DIMfield$(fields)
  136 name$="d.roll"
  137 channel=OPENIN(name$)
  140 REPEAT
  150 PROCprintall
  160 UNTIL PTR#channel>=EXT#channel
  170 CLOSE#0
  180 *DR.0
  190 END
  200 :
 2000 DEFPROCload(name$)
 2010 LOCALchannel,field
 2020 channel=OPENIN(name$)
 2030 INPUT#channel,fields
 2040 DIM fieldname$(fields),size(fields)
 2050 FOR field = 1 TO fields
 2060 INPUT#channel,fieldname$(field),siz
e(field)
 2070 NEXT
 2080 CLOSE#channel
 2090 ENDPROC
 2100 :
 5000 DEF PROCprintall
 5010 LOCAL field
 5030 FOR field=1 TO fields
 5040 INPUT#channel,field$(field)
 5050 NEXT:IFLEFT$(field$(1),1)<=" " ENDP
ROC
 5060 FORfield= 1 TO 4:PRINTfield$(field)
;:NEXT:PRINT
 5070 FORfield= 5 TO 8:PRINTfield$(field)
;:NEXT:PRINT
 5080 FORfield= 9 TO fields:PRINTfield$(f
ield);:NEXT:PRINT
 5090 PRINTSTRING$(79,"_")
 5100 ENDPROC
```

Listing 4. Prints the computer list of file contents

```
   10 REM RAF - Print class list
   20 REM by Joe Telford
   30 REM for BBC with discs
   40 REM (c) Acorn User
   50 :
  100 ONERROR REPORT:CLOSE#0:END
  110 MODE3
  120 PROCload("d.heading")
  130 PROCsetup
  140 FORsex=0 TO 1:PRINT'type$(sex)':REP
EAT
  150 PROCprintclass(sex$(sex))
  160 UNTIL PTR#channel>=EXT#channel
  170 PTR#channel=0:NEXT
  180 CLOSE#0
  190 END
 1000 DEFPROCsetup
 1010 DIMfield$(fields),sex$(1),type$(1)
 1020 sex$(1)="M":sex$(0)="F"
 1030 type$(0)="Girls":type$(1)="Boys"
 1040 name$="d.roll"
 1050 channel=OPENIN(name$)
 1060 PRINT"CLASS LIST"
 1070 PRINT"----------"
 1080 ENDPROC
 2000 DEFPROCload(name$)
 2010 LOCALchannel,field
 2020 channel=OPENIN(name$)
 2030 INPUT#channel,fields
 2040 DIM fieldname$(fields),size(fields)
 2050 FOR field = 1 TO fields
 2060   INPUT#channel,fieldname$(field),si
ze(field)
 2070 NEXT
 2080 CLOSE#channel
 2090 ENDPROC
 5000 DEF PROCprintclass(sex$)
 5010 LOCAL field
 5030 FOR field=1 TO fields
 5040 INPUT#channel,field$(field)
 5050 NEXT:IFLEFT$(field$(1),1)<=" " ENDP
ROC
 5060 IFfield$(4)=sex$ PRINTfield$(3);fie
ld$(2)
 5100 ENDPROC
```

Listing 5. Prints class list of boys and girls

Listing 6. Basis for bubblesort

```
   10 REM RAF - Sorting the RAF
   20 REM by Joe Telford
   30 REM for BBC with discs
   40 REM (c) Acorn User
   50 :
  100 ONERROR REPORT:CLOSE#0:END
  110 MODE3
  120 PROCload("d.heading")
  130 INPUT "Sort based on field "field
  140 DIMfield$(fields),low$(fields),high
$(fields)
  150 reclength=FNsize
  160 name$="d.roll"
  170 channel=OPENUP(name$)
  180 count=(EXT#channel DIV reclength)-1
  190 PRINT"Sorting! please wait."
  200 PROCsort(field,count,reclength,fiel
ds)
  210 PRINT'"Renumbering!"
  220 PROCrenumber(count,reclength)
  230 PRINT'"Done!"
  240 CLOSE#0
  250 END
 2000 DEFPROCload(name$)
 2010 LOCALchannel,field
 2020 channel=OPENIN(name$)
 2030 INPUT#channel,fields
 2040 DIM fieldname$(fields),size(fields)
 2050 FOR field = 1 TO fields
 2060 INPUT#channel,fieldname$(field),siz
e(field)
 2070 NEXT
 2080 CLOSE#channel
 2090 ENDPROC
 3100 DEF FNsize
 3110 LOCALfield,len:len=0
 3120 FOR field = 1 TO fields
 3130 len=len+size(field)+2
 3140 NEXTfield
 3150 =len
 3160 :
 5000 DEFPROCsort(key,count,reclength,fie
lds)
 5010 LOCALfield,outer,last,inner,swapfla
g,A$,B$
 5020 last=count
 5030 FOR outer = 1 TO count:PRINT".";:PT
R#channel=0
 5040 last=last-1:swapflag=0
 5050 FOR inner=0 TO last
 5060 FOR field= 1 TO fields:INPUT#channe
l,low$(field):NEXT
```

Continued ▶

See 'What Acorn don't tell you about the Z80', page 121

Listing 1

```
    10 REM NET *BUILD extract
    11 REM uses OSARGS to return NFS vers
ion
    12 REM by Robin Newman
    13 :
    20 osargs=&FFDA : pb%=&70
    80 .start LDA#1:LDY#0:LDX#pb%:JSR osa
rgs
    90 LDY#0:LDA#2:JSR osargs:CMP#2:BNE n
ot334 \ check if NFS3.34
   100 LDY#0 \ search for space after BUI
LD
```

Listing 3

```
    10 REM THIS IS A TEST PROGRAM
    20 REM TO SHOW HOW Z80 BASIC
    30 REM IS STORED.
    40 PRINT"AN EXAMPLE OF BAD PROGRAMMIN
G!"
    50 GOTO70
    60 END
    70 PRINT"THAT'S ALL FOLKS!"
    80 GOTO60
```

◀ *Continued*

```
 5070 FOR field= 1 TO fields:INPUT#channe
l,high$(field):NEXT
 5080 A$=low$(key):B$=high$(key)
 5090 IF A$=STRING$(size(key)," ") A$=STR
ING$(size(key),"z")
 5100 IF B$=STRING$(size(key)," ") B$=STR
ING$(size(key),"z")
 5110 IF A$>B$ swapflag=FNswap
 5120 PTR#channel=PTR#channel-reclength
 5130 NEXTinner
 5140 IFswapflag=0 outer=count
 5150 NEXTouter
 5160 PTR#channel=0
 5170 ENDPROC
 5180 :
 5200 DEF FNswap
 5210 LOCALfield
 5220 PTR#channel =PTR#channel-2*reclengt
h
 5230 FORfield=1 TO fields:PRINT#channel,
high$(field):NEXT
 5240 FORfield=1 TO fields:PRINT#channel,
low$(field):NEXT
 5250 =1
 5300 DEFPROCrenumber(count,reclength)
 5310 LOCALrecord,A$
 5320 FOR record = 0 TO count
 5330 PTR#channel=record*reclength
 5335 INPUT#channel,A$
 5336 PTR#channel=record*reclength
 5340 IF A$>STRING$(size(1)," ") PRINT#ch
annel,STR$(record)+STRING$(size(1)-LEN(ST
R$(record))," ")
 5350 IF A$=STRING$(size(1)," ") record=c
ount
 5360 NEXTrecord:ENDPROC
```

Listing 2

```
  10 REM alternative decoding of input
  11 REM line for *BUILD
  12 REM by Felsted School
  13 :
  20 osargs=&FFDA
  30 p=&72
  70 .start LDA#1:LDX# p MOD256:LDY#0
  80 JSR osargs \get cmnd line pointer
  90 JSR getname \ get filename
 100 \program continues with p and p+1
 110 \pointing to start of filename
 120 \regardless of NFS version
 570 RTS
 580 .getname LDY#0
 590 .L11 LDA(p),Y:INY \get next charcter
 600 CMP#&D:BEQ L10 \branch if return
 605 \if branch taken in line 600 then
 606 \no spaces found in command line
 607 \p and p+1 must point to start
 608 \ of filename if command line valid.
 610 CMP#&20:BNE L11 \ look for a space,
go back if not
 620 DEY \ found, point to previous char.
 630 .L12 INY:LDA(p),Y \ get next char.
 640 CMP#&20:BEQ L12 \ go back until char
 not space
 650 TYA \ offset in command line transfe
rred to A
 660 CLC:ADC p \ add offset to p so that
 670 BCC L13 \ p and p+1 point to
 680 INC p+1 \ start of filename
 690 .L13 STA p
 700 .L10 RTS \exit, p and p+1 point to f
ilename
```

Listing 4

```
   10 REM Z80 2P BBC Basic warm start
   20 REM by Robin Newman
   30 REM for Tube 1.2 and Bios 1.20
   40 REM HIMEM MUST be <= &D300
   50 REM (c) Acorn User - Feb.1985
   55 :
   60 MODE7
   70 HIMEM=&D300:REM page below CCP
   80 FOR Z%=0TO2STEP2
   90 P%=&D300
  100 [OPT Z%
  110 \first set up patch intercept
  120 LD HL,&F539 \intercept jump addres
s from boot ROM to Bios
  130 LD (HL), p% MOD256 \point to patch
 code
  140 INC HL
  150 LD (HL), p% DIV 256
  160 JP &F4CF \boot ROM entry for *CPM
  170 \patch code follows
  180 .p% LD HL,&ECF5 \intercept Bios ju
mp to CCP
  190 LD (HL),3 \replace it with JP &103
  200 INC HL \warm start to Basic
  210 LD (HL),1
  220 JP &EA00 \jump to Bios cold start
entry
  230 ]:NEXT
  240 REM BREAK key to call patch & rese
t
  250 *K.10GO D300|M*FX229|M
  260 PRINTTAB(0,2)"Basic warm start pat
ch now active"
```

See page 106 for figures 1 to 3 ▶

```
START ADDRESS 1B00
END ADDRESS 1B9D
1B00       D  0  A 1C F4 20 54 48     : ..... TH
1B08      49 53 20 49 53 20 41 20     : IS IS A 
1B10      54 45 53 54 20 50 52 4F     : TEST PRO
1B18      47 52 41 4D  D  0 14 1B     : GRAM....
1B20      F4 20 54 4F 20 53 48 4F     : . TO SHO
1B28      57 20 48 4F 57 20 5A 38     : W HOW Z8
1B30      30 20 42 41 53 49 43  D     : 0 BASIC.
1B38       0 1E 10 F4 20 49 53 20     : .... IS 
1B40      53 54 4F 52 45 44 2E  D     : STORED..
1B48       0 28 25 F1 22 41 4E 20     : .(%."AN 
1B50      45 58 41 4D 50 4C 45 20     : EXAMPLE 
1B58      4F 46 20 42 41 44 20 50     : OF BAD P
1B60      52 4F 47 52 41 4D 4D 49     : ROGRAMMI
1B68      4E 47 21 22  D  0 32  9     : NG!"..2.
1B70      E5 8D 44 46 40  D  0 3C     : ..DF@..<
1B78       5 E0  D  0 46 18 F1 22     : ....F.."
1B80      54 48 41 54 27 53 20 41     : THAT'S A
1B88      4C 4C 20 46 4F 4C 4B 53     : LL FOLKS
1B90      21 22  D  0 50  9 E5 8D     : !"..P...
1B98      54 7C 40  D FF 50           : T @..P
```

Figure 1. Program 3 as stored in 6502 BBC Basic

```
START ADDRESS 3B00
END ADDRESS 3B9E
3B00      1C  A  0 F4 20 54 48 49     : .... THI
3B08      53 20 49 53 20 41 20 54     : S IS A T
3B10      45 53 54 20 50 52 4F 47     : EST PROG
3B18      52 41 4D  D 1B 14  0 F4     : RAM.....
3B20      20 54 4F 20 53 48 4F 57     :  TO SHOW
3B28      20 48 4F 57 20 5A 38 30     :  HOW Z80
3B30      20 42 41 53 49 43  D 10     :  BASIC..
3B38      1E  0 F4 20 49 53 20 53     : ... IS S
3B40      54 4F 52 45 44 2E  D 25     : TORED..%
3B48      28  0 F1 22 41 4E 20 45     : (.."AN E
3B50      58 41 4D 50 4C 45 20 4F     : XAMPLE O
3B58      46 20 42 41 44 20 50 52     : F BAD PR
3B60      4F 47 52 41 4D 4D 49 4E     : OGRAMMIN
3B68      47 21 22  D  9 32  0 E5     : G!"..2..
3B70      8D 44 46 40  D  5 3C  0     : .DF@..<.
3B78      E0  D 18 46  0 F1 22 54     : ...F.."T
3B80      48 41 54 27 53 20 41 4C     : HAT'S AL
3B88      4C 20 46 4F 4C 4B 53 21     : L FOLKS!
3B90      22  D  9 50  0 E5 8D 54     : "..P...T
3B98      7C 40  D  0 FF FF 41        :  @....A
```

Figure 2. Program 3 as stored in Z80 Basic

```
START ADDRESS 3B00
END ADDRESS 3B9E
3B00      1C  0  0 F4 20 54 48 49     : .... THI
3B08      53 20 49 53 20 41 20 54     : S IS A T
3B10      45 53 54 20 50 52 4F 47     : EST PROG
3B18      52 41 4D  D 1B  0  0 F4     : RAM.....
3B20      20 54 4F 20 53 48 4F 57     :  TO SHOW
3B28      20 48 4F 57 20 5A 38 30     :  HOW Z80
3B30      20 42 41 53 49 43  D 10     :  BASIC..
3B38       0  0 F4 20 49 53 20 53     : ... IS S
3B40      54 4F 52 45 44 2E  D 25     : TORED..%
3B48       0  0 F1 22 41 4E 20 45     : ..."AN E
3B50      58 41 4D 50 4C 45 20 4F     : XAMPLE O
3B58      46 20 42 41 44 20 50 52     : F BAD PR
3B60      4F 47 52 41 4D 4D 49 4E     : OGRAMMIN
3B68      47 21 22  D  9  0  0 E5     : G!".....
3B70      8D 44 46 40  D  5 3C  0     : .DF@..<.
3B78      E0  D 18 46  0 F1 22 54     : ...F.."T
3B80      48 41 54 27 53 20 41 4C     : HAT'S AL
3B88      4C 20 46 4F 4C 4B 53 21     : L FOLKS!
3B90      22  D  9  0  0 E5 8D 54     : "......T
3B98      7C 40  D  0 FF FF 1A        :  @.....
```

Figure 3. Program 3 modified by UNLIST.COM

See 'Turtle Graphics', page 158

Listing 1. Changes screen colour. Save program and list using LIST07 to see structure

```
   1 REM Using FN's with EVAL
   2 REM by Malcolm Banthorpe
   3 REM for BBC and Electron
   4 REM (c) Acorn User - Feb.1985
   5 :
  10 MODE 5
  15 COLOUR 0:COLOUR 131:CLS
  20 REPEAT
  30 REPEAT
  40 INPUT"colour "C$
  50 UNTIL C$="RED" OR C$="YELLOW" OR
 C$="WHITE" OR C$="QUIT"
  60 UNTIL EVAL ("FN"+C$)=FALSE
  70 END
  80 :
  90 DEF FNRED
 100 COLOUR 129:CLS
 110 =TRUE
 120 DEF FNYELLOW
 130 COLOUR 130:CLS
 140 =TRUE
 150 DEF FNWHITE
 160 COLOUR 131:CLS
 170 =TRUE
 180 DEF FNQUIT
 190 =FALSE
```

Listing 2. Turtle graphics interpreter

```
   1 REM Turtle Graphics
   2 REM by Malcolm Banthorpe
   3 REM for BBC and Electron
   4 REM (c) Acorn User - Feb.85
   5 :
  10 MODE1
  20 PROCinitialise
  30 :
  40 REPEAT F%=0:W$(2)=""
  50 PROCw1:PRINTt$:PROCw2
  60 INPUTTAB(0,4)A$
  70 A$=FNlower(A$)
  80 PROCw1:CLS:PROCw2
  90 UNTIL FNinterpret(A$)=FALSE
 100 MODE7
 110 END
 120 :
 130 DEF FNinterpret(A$)
 140 xpos=X:ypos=Y:angle=A%
 150 LOCAL P%,I%,N%:P%=C%:LOCALC%
 160 IF FNwords(A$)=0 =TRUE
 170 IF W$(1)="end" =TRUE
 180 IF W$(1)="again" =TRUE
 190 E1%=TRUE
 200 FOR I%=1 TO VALC$(0)
 210 A$=C$(I%)
 220 IF RIGHT$(W$(1),1)="." A$=LEFT$(A$
,LENW$(1)-1)+"."
 230 IF W$(1)=A$ C%=I%:C$=C$(I%):I%=VAL
C$(0)
 240 NEXT
 250 IF C%=0 PROCe1: =TRUE
 260 E1%=FALSE
 270 D%=VAL(W$(2))
 280 IF C%<22 =EVAL("FN"+C$)
 290 F%=1:REPEAT
 300 D%=FNinterpret(C$(C%+1)):C%=C%+1
 310 UNTIL C$(C%)="end": =TRUE
 320 :
 330 DEF FNclear
 340 CLG:MOVE0,0:A%=0:X=0:Y=0:S=0:C=1
 350 scale=1:PROCupdate: =TRUE
 360 :
 370 DEF FNpenup K%=0: =TRUE
 380 :
 390 DEF FNpendown K%=1: =TRUE
 400 :
 410 DEF FNright PROCpointer
 420 A%=A%+EVALW$(2)
 430 S=SINRADA%:C=COSRADA%
 440 PROCupdate: =TRUE
 450 :
 460 DEF FNleft PROCpointer
 470 A%=A%+EVALW$(2)
 480 S=SINRADA%:C=COSRADA%
 490 PROCupdate: =TRUE
 500 :
 510 DEF FNthinlines
 520 FL% = FALSE: =TRUE
 530 :
 540 DEF FNfatlines
 550 FL% = TRUE
 560 W%=2*EVALW$(2): =TRUE
 570 :
 580 DEF FNoutline
 590 OL%=D%: =TRUE
 600 :
 610 DEF FNforward
 620 PROCpointer
 630 LX=X:LY=Y:D%=EVAL(W$(2))
 640 X=X+D%*S*scale+1E-5
 650 Y=Y+D%*C*scale+1E-5
 660 IF (FL% AND K%) PROCline1 ELSE PRO
Cline2
 670 PROCupdate: =TRUE
 680 :
 690 DEF PROCline2
 700 PLOTK%+4,X,Y
 710 ENDPROC
 720 :
 730 DEFPROCline1
 740 x=W%*C:y=W%*S
 750 MOVE LX-x,LY+y:MOVE LX+x,LY-y
 760 PLOT84+K%,X-x,Y+y
 770 PLOT84+K%,X+x,Y-y
 780 IF OL%>0 PROCoutline
 790 ENDPROC
 800 :
 810 DEF PROCoutline
 820 GCOL0,OL%
 830 MOVE LX-x,LY+y:DRAW X-x,Y+y
 840 MOVE LX+x,LY-y:DRAW X+x,Y-y
 850 ENDPROC
 860 :
 870 DEF FNmove
 880 PROCpointer
 890 X=D%:Y=VALW$(3)
 900 MOVEX,Y
 910 PROCupdate: =TRUE
 920 :
 930 DEF FNpencolour
 940 GCOL0,D%:c%=D%:=TRUE
 950 :
 960 DEF FNsetcolour
 970 VDU19,VALW$(2),EVALW$(3);0;
 980 =TRUE
 990 :
1000 DEF FNquit =FALSE
1010 :
1020 DEF FNto LOCAL J%
1025 IF W$(2)="" PRINTCHR$7"TO WHAT?":=
TRUE
1026 E%=FALSE:FOR J%=22 TO VALC$(0)
1027 IF W$(2)=C$(J%) E%=TRUE:J%=VALC$(0
)
```

Continued ▶

◄ Continued

```
1028 NEXT
1029 IF E% PRINTCHR$(7)W$(2)" ALREADY D
EFINED":=TRUE
1030 COLOUR1:PROCw1:PRINTt$:PROCw2
1040 Q%=VALC$(0):J%=Q%+1:C$(J%)=W$(2)
1050 REPEAT J%=J%+1
1060 PROCw1:PRINTt$:PROCw2
1070 INPUTTAB(0,4)A$
1080 PROCw1:CLS:PROCw2
1090 C$(J%)=FNlower(A$)
1100 D%=FNinterpret(C$(J%))
1110 IF E1%=TRUE J%=J%-1
1120 UNTIL C$(J%)="end"
1130 COLOUR 0
1140 C$(0)=STR$J%:=TRUE
1150 :
1160 DEF FNrepeat
1170 IF F%=0 =TRUE
1180 LOCAL T%,J%,R%:R%=P%
1190  FORJ%=1 TO VAL W$(2)-1
1200 T%=R%+2
1210 REPEAT
1220 D%=FNinterpret(C$(T%)):T%=T%+1
1230 UNTIL C$(T%)="again" OR C$(T%)="en
d"
1240 NEXT
1250 C%=T%+1:=TRUE
1260 :
1270 DEF FNscale
1280 scale=scale*EVALW$(2)
1290 =TRUE
1300 :
1310 DEF FNsetscale
1320 scale=EVALW$(2)
1330 =TRUE
1340 :
1350 DEF FNlist LOCAL T%,I%
1360 IF W$(2)="" =TRUE
1370 IF C$(0)="21" =TRUE
1380 FORI%=22 TO VALC$(0)
1390 IF W$(2)=C$(I%) T%=I%:I%=VALC$(0)
1400 NEXT:IF T%=0 PROCe1:=TRUE
1410 VDU28,1,25,20,1,30
1420 COLOUR3:COLOUR128
1430 PRINT"to "W$(2)'
1440 REPEAT T%=T%+1
1450 PRINTC$(T%)
1460 UNTIL C$(T%)="end"
1470 COLOUR0:COLOUR131
1480 PROCinfo: =TRUE
1490 :
1500  DEF FNforget LOCAL T%,T1%,I%
1510 IF W$(2)="" =TRUE
1520 FORI%=22 TO VALC$(0)
1530 IF W$(2)=C$(I%) T%=I%:I%=VALC$(0)
1540 NEXT:IF T%=0 =TRUE
1550 T1%=T%
1560 REPEAT T%=T%+1
1570 UNTIL C$(T%)="end"
1580 FOR I%=0 TO VALC$(0)-T%-1
1590 C$(T1%+I%)=C$(T%+I%+1)
1600 NEXT
1610 C$(0)=STR$(VALC$(0)+T1%-T%-1)
1620 =TRUE
1630 :
1640 DEF FNtrail(A$)
1650 IF RIGHT$(A$,1)<>" " =A$
1660 =FNtrail(LEFT$(A$,LENA$-1))
1670 :
1680 DEF FNsave
1690  F=OPENOUT(W$(2))
1700 PRINT#F,C$(0)
1710 FOR I%=22 TO VALC$(0)
1720 PRINT#F,C$(I%)
1730 NEXT
1740 CLOSE#F
1750 =TRUE
1760 :
1770 DEF FNload
1780  F=OPENUP(W$(2))
1790 INPUT#F,C$(0)
1800 FOR I%=22 TO VALC$(0)
1810 INPUT#F,C$(I%)
1820 NEXT
1830 CLOSE#F
1840 =TRUE
1850 :
1860 DEF FNlead(A$)
1870 IF LEFT$(A$,1)<>" " =A$
1880 =FNlead(RIGHT$(A$,LENA$-1))
1890 :
1900 DEF FNwords(A$) LOCAL I%
1910 IF LENA$=0 =0
1920 A$=FNlead(A$)
1930 N%=N%+1:I%=INSTR(A$," ")
1940 IF I%=0 W$(N%)=A$:=N%
1950 W$(N%)=LEFT$(A$,I%-1)
1960 =FNwords(RIGHT$(A$,LENA$-I%))
1970 :
1980 DEF FNlower(A$) LOCAL B$,T$,T%
1990 FORI%=1 TO LENA$
2000 T$=MID$(A$,I%,1):T%=ASCT$
2010 IF T%<97 AND T%>64 T$=CHR$(T%+32)
2020 B$=B$+T$:NEXT
2030 =B$
2040 :
2050 DEF PROCpointer LOCAL A%,B%,C%,D%
2060 GCOL3,3:MOVEX,Y
2070 A%=24*C:B%=32*S:C%=24*S:D%=32*C
2080 PLOT0,-A%,C%:PLOT1,A%+B%,-C%+D%
2090 PLOT65,0,0:PLOT1,A%-B%,-C%-D%
2100 MOVEX,Y:GCOL0,c%
2110 ENDPROC
2120 :
2130 DEF PROCinfo LOCAL S
2140 S=INT(scale*100)/100
2150 VDU28,35,30,39,27,30:CLS
2160 PRINT;INTX'INTY'S'A%MOD360;
2170 PROCw2
2180 ENDPROC
2190 :
2200 DEF PROCupdate
2210 PROCpointer:PROCinfo
2220 ENDPROC
2230 :
2240 DEF PROCe1
2250 PRINT TAB(0,4);CHR$7;"NOT DEFINED
YET !"
2260 ENDPROC
2265 :
2270 DEF PROCw1 VDU28,2,31,5,29:ENDPROC
2280 :
2290 DEF PROCw2 VDU28,6,31,27,27:ENDPRO
C
2300 :
2320 DEF PROCinitialise
2330 COLOUR 0:COLOUR131
2340 K%=1:A%=0:c%=3:W%=0:OL%=0
2350 FL%=FALSE:E1%=FALSE
2360 S=0:C=1:X=0:Y=0:scale=1
2370 red=1:green=2:yellow=3
2380 blue=4:magenta=5
2390 cyan=6:white=7:black=0
2400 FOR C%=224 TO 227:VDU 23,C%
2410 FOR B%=1 TO 8
```

Continued ►



◄ Continued

```
2420 READ N%:VDU N%
2430 NEXT:NEXT
2440 t$=CHR$224+CHR$225+CHR$226+CHR$10+
STRING$(3,CHR$8)+CHR$227+CHR$227
2450 VDU24,8;164;1271;1015;29,640;592;
2460 CLS:CLG
2470 VDU28,29,31,39,27
2480 PRINT"X"'"Y"'"Scale"'"Angle"
2490 VDU28,8,31,27,27:CLS
2500 DIMW$(3),C$(100)
2510 FOR I%=1 TO 21:READC$(I%):NEXT
2520 C$(0)="21":PROCupdate
2530 ON ERROR IF ERR=17 C$(0)="21":GOTO
40 ELSE REPORT:PRINT" at ";ERL:GOTO40
2540 ENDPROC
2550 :
2560 DATA 0,0,63,106,209,255,146,127
2570 DATA 0,0,248,44,70,255,73,255
2580 DATA 0,0,0,0,60,118,252,248
2590 DATA 6,124,248,0,0,0,0,0
2600 :
2610 DATA clear,penup,pendown,right
2620 DATA left,forward,move,pencolour
2630 DATA quit,to,repeat,scale,save
2640 DATA load,list,setcolour
2650 DATA fatlines,thinlines
2660 DATA outline,setscale,forget
```

See 'Printers with, er . . . character', page 177

Listing 1. Basic colour screen dump for the Seikosha GP700A

```
  10 REM SEIKBAS
  20 REM Colour Screen Dump for Seikosha
GP 700A
  30 REM G.B.HILL October 1984
  40 :
  50 DIM command 10
  60 $command=CHR$(27)+"C640512"
  70 VDU2
  80 FOR I=0 TO 7:VDU1,command?I:NEXT
  90 FOR Y%=1022 TO 0 STEP -2
 100 FOR X%=0 TO 1278 STEP 2
 110 VDU1,POINT(X%,Y%)
 130 NEXT
 140 NEXT
 141 VDU3
 145 END
```

Listing 2. Machine code version of listing 1

```
  10 REM SKPHYS
  20 REM Colour Screen Dump for
  30 REM Seikosha GP 700A
  40 REM Activated by CALL &900
  50 REM G.B.HILL October 1984
  60 :
  70 oswrch=&FFEE
  80 osword=&FFF1
  90 PROCassemble
 100 END
 110 :
 120 DEF PROCassemble
 130 FOR opt=0 TO 2 STEP 2
 140 P%=&900
 150 [
 160 OPT opt
 170 .jump          jmp dump
 180 \
 190 \Subroutines
 200 \
 210 .setup         lda #0
 \Set X=0,Y=1022
 220                sta block
 230                sta block+1
 240                lda #&FE
 250                sta block+2
 260                lda #&3
 270                sta block+3
 280                ldx #0
 \Send command string
 290 .comloop       lda #1
 300                jsr oswrch
 310                lda command,X
 320                jsr oswrch
 330                inx
 340                cpx #11
 350                bne comloop
 360                rts
 370 \
 380 .point         lda #9
 390                ldx #block MOD 256
 400                ldy #block DIV 256
 410                jsr osword
 420                lda #&B
 430                ldx #(block+4) MOD 25
6
 440                ldy #(block+4) DIV 25
6
 450                jsr osword
 460 \
 470                lda #1
 \Send to printer
 480                jsr oswrch
 490                lda block+5
 500                jsr oswrch
 510                rts
 520 \
 530 \Main Loop
 540 \
 550 .dump          lda #2
 560                jsr oswrch
 570                jsr setup
 580 .loop          jsr point
 590                inc block
 \Increment X
 600                inc block
 610                bne loop
 620                inc block+1
 630                lda block+1
 640                cmp #5
 650                bne loop
 \Reset at end of line (X=1280)
 660                lda #0
 670                sta block+1
 680                sec
 \Decrement Y
 690                lda block+2
 700                sbc #2
 710                sta block+2
 720                lda block+3
 730                sbc #0
 740                sta block+3
 750                cmp #&FF
 760                bne loop
 \End of page when Y goes negative
 770                ldx #10
 \Send 10 linefeeds at page end
 780 .lfloop        lda #1
 790                jsr oswrch
 800                lda #10
 810                jsr oswrch
 820                dex
 830                bne lfloop
 840                lda #3
 850                jsr oswrch
 860                rts
 870 ]
 880 REM Reserve space for OSWORD block
 890 block=P%:P%=P%+9
 900 REM Reserve space for command strin
g
 910 command=P%:P%=P%+12
 920 REM Command to do two-pass printing
 930 REM with black as background.
 940 $command=CHR$(27)+"E"+CHR$(27)+"f"+
CHR$(27)+"C640512"
 950 NEXT
 960 ENDPROC
```

Listing 3. Interrupt-type dump for the Seikosha GP700A

```
  10 REM SEIKAT
  20 REM Colour Screen Dump
  30 REM for Seikosha GP 700A
  40 REM Activated by pressing the @ key
  50 REM G.B.HILL October 1984
  60 :
  70 oswrch=&FFEE
  80 osword=&FFF1
  90 PROCassemble
 100 REM Enable key-pressed event
 110 *FX14,2
 120 REM Point to interrupt routine
 130 ?&220=&00
```

Continued ▶

◀ Continued

```
140 ?&221=&9
150 END
160 :
170 DEF PROCassemble
180 FOR opt=0 TO 2 STEP 2
190 P%=&900
200 [
210 OPT opt
220 \Test for @ key
230 .key            php
240                 cpy #64
250                 bne out
260                 jmp dump
270 .out            plp
280                 rts
290 \
300 \Subroutines
310 \
320 .setup          lda #0
330                 sta block
340                 sta block+1
350                 lda #&FE
360                 sta block+2
370                 lda #&3
380                 sta block+3
390                 ldx #0
400 .comloop        lda #1
410                 jsr oswrch
420                 lda command,X
430                 jsr oswrch
440                 inx
450                 cpx #11
460                 bne comloop
470                 rts
480 \
490 .point          lda #9
500                 ldx #block MOD 256
510                 ldy #block DIV 256
520                 jsr osword
530                 lda #&B
540                 ldx #(block+4) MOD 25
6
550                 ldy #(block+4) DIV 25
6
560                 jsr osword
570                 lda #1
580                 jsr oswrch
590                 lda block+5
600                 jsr oswrch
610                 rts
620 \
630 \Main program mainly as for SKPHYS
640 \but save registers on stack first
650 \
660 .dump           pha:txa:pha:tya:pha
670                 lda #2
680                 jsr oswrch
690                 jsr setup
700 .loop           jsr point
710                 inc block
720                 inc block
730                 bne loop
740                 inc block+1
750                 lda block+1
760                 cmp #5
770                 bne loop
780                 lda #0
790                 sta block+1
800                 sec
810                 lda block+2
820                 sbc #2
830                 sta block+2
840                 lda block+3
850                 sbc #0
860                 sta block+3
870                 cmp #&FF
880                 bne loop
890                 ldx #10
900 .lfloop         lda #1
910                 jsr oswrch
920                 lda #10
930                 jsr oswrch
940                 dex
950                 bne lfloop
960                 lda #3
970                 jsr oswrch
980 \Restore registers on exit
990                 pla:tay:pla:tax:pla
1000                jmp out
1010 ]
1020 block=P%:P%=P%+9
1030 command=P%:P%=P%+7
1040 $command=CHR$(27)+"E"+CHR$(27)+"f"+
CHR$(27)+"C640512"
1050 NEXT
1060 ENDPROC
```

Listing 4. This tests the capabilities of the Seikosha GP700A

```
10 REM SKTEST
20 REM to test the capabilities of th
e SEIKOSHA GP700A printer
30 REM  G.B.Hill 1984
40 :
50 MODE 7
60 ON ERROR PROCerror:GOTO 350
70 :
80 REM Constant definitions
90 DIM com 20
100 UC$="THE QUICK BROWN FOX JUMPS OVE
R THE LAZY DOG"
110 LC$="The quick brown fox jumps ove
r the lazy dog again in lower case"
120 up=TRUE
130 down=FALSE
140 black=0
150 magenta=1
160 red=2
170 purple=3
180 green=4
190 cyan=5
200 yellow=6
210 :
220 REM Main Program
230 REM Set page length, paging off,pr
inter on.
240 PROCsend(CHR$(27)+"Z"+CHR$(0)+CHR$
(11))
250 VDU15,2
260 PRINT"PRINTED ON SEIKOSHA GP700A."

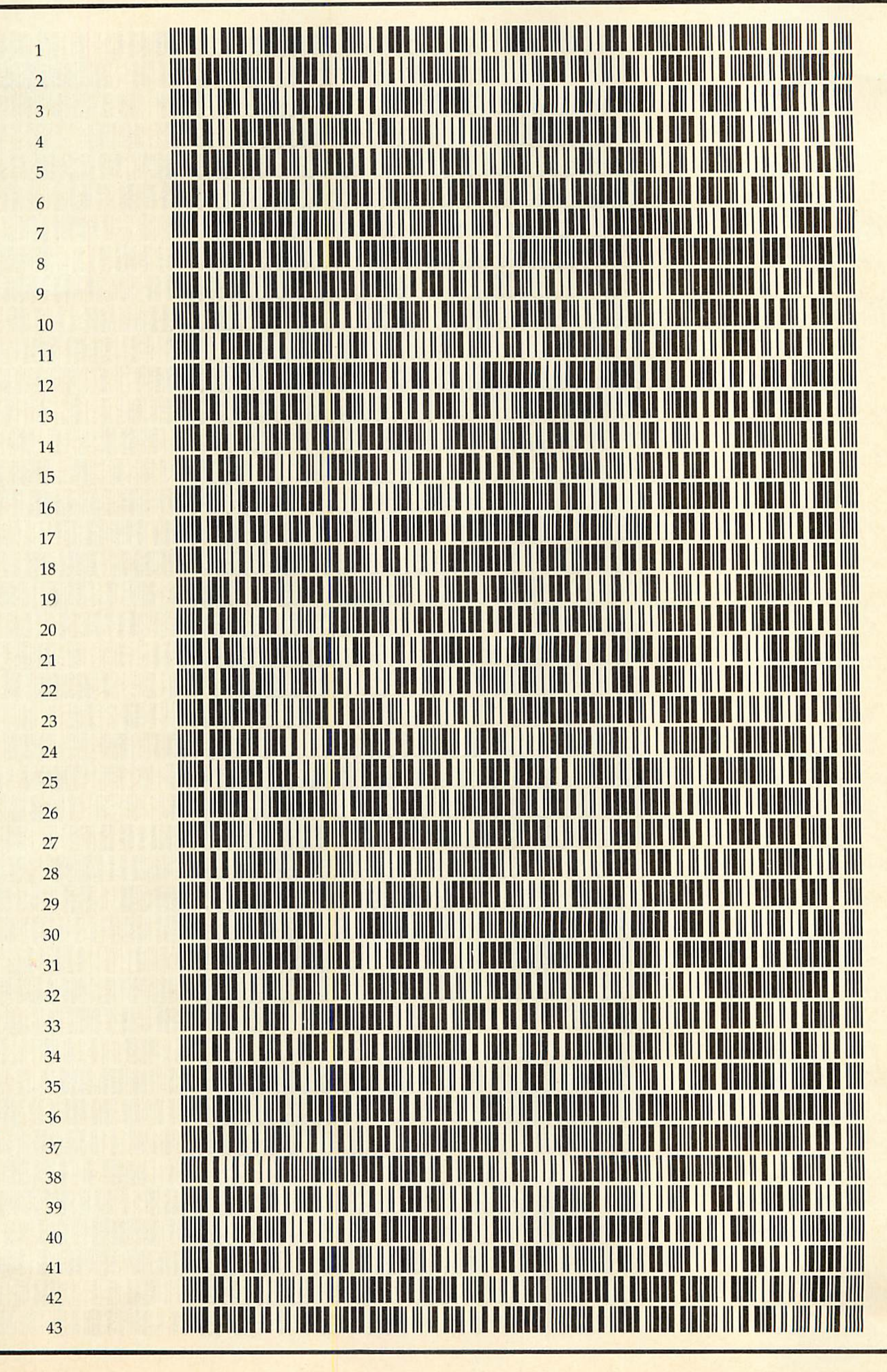
270 PRINTUC$'LC$'
280 PROCcharacter_set
290 PROCcolours
300 PROCstyles
310 PROCtab
320 PROClinefeed
330 PROCgraphics1
340 PROCgraphics2
350 VDU1,12,3,14
360 END
370 :
380 DEF PROCerror
390 REPORT:PRINT" at line ";ERL
400 ENDPROC
410 :
420 DEF PROCsend($com)
```

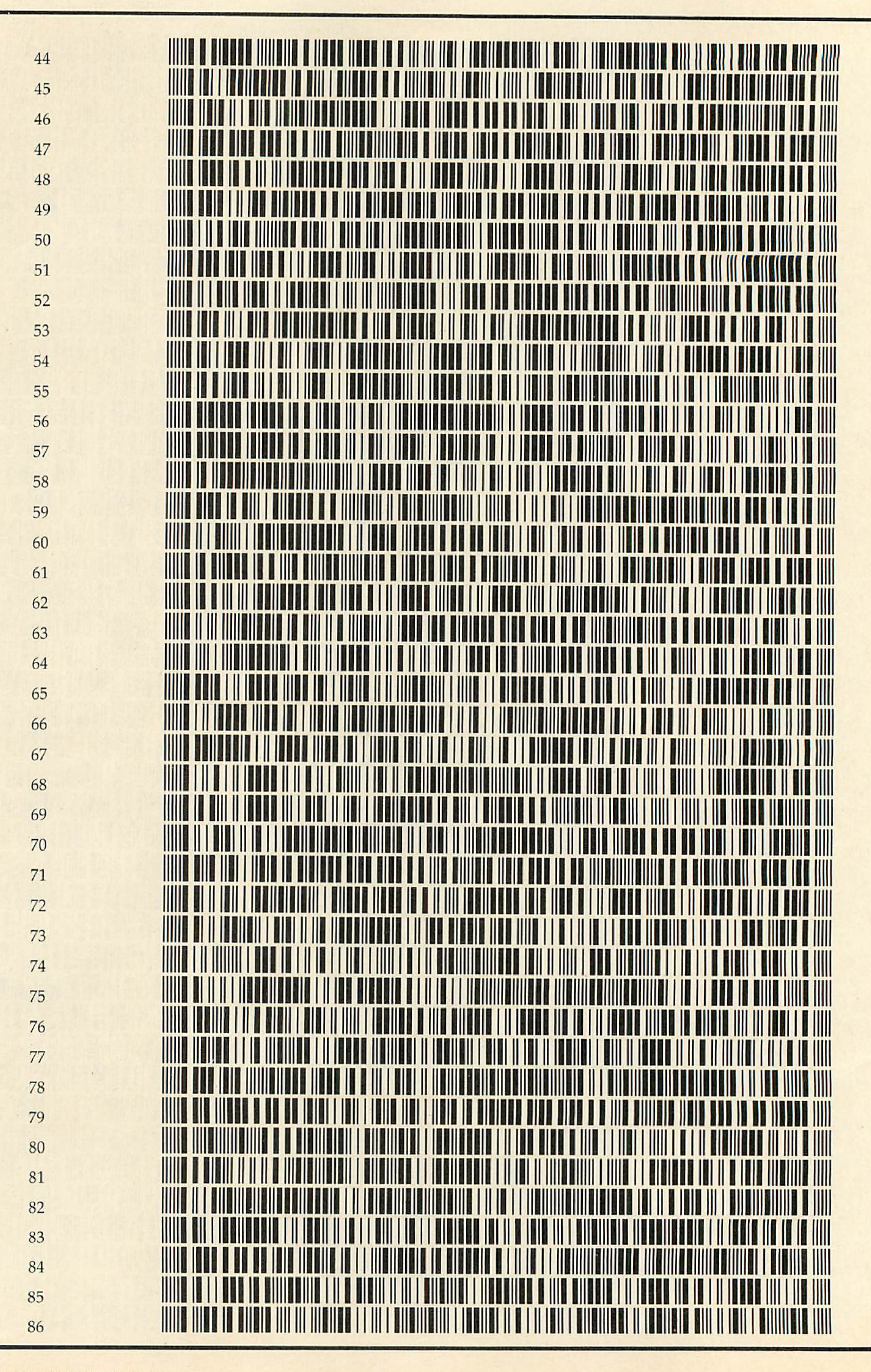
Continued ▶

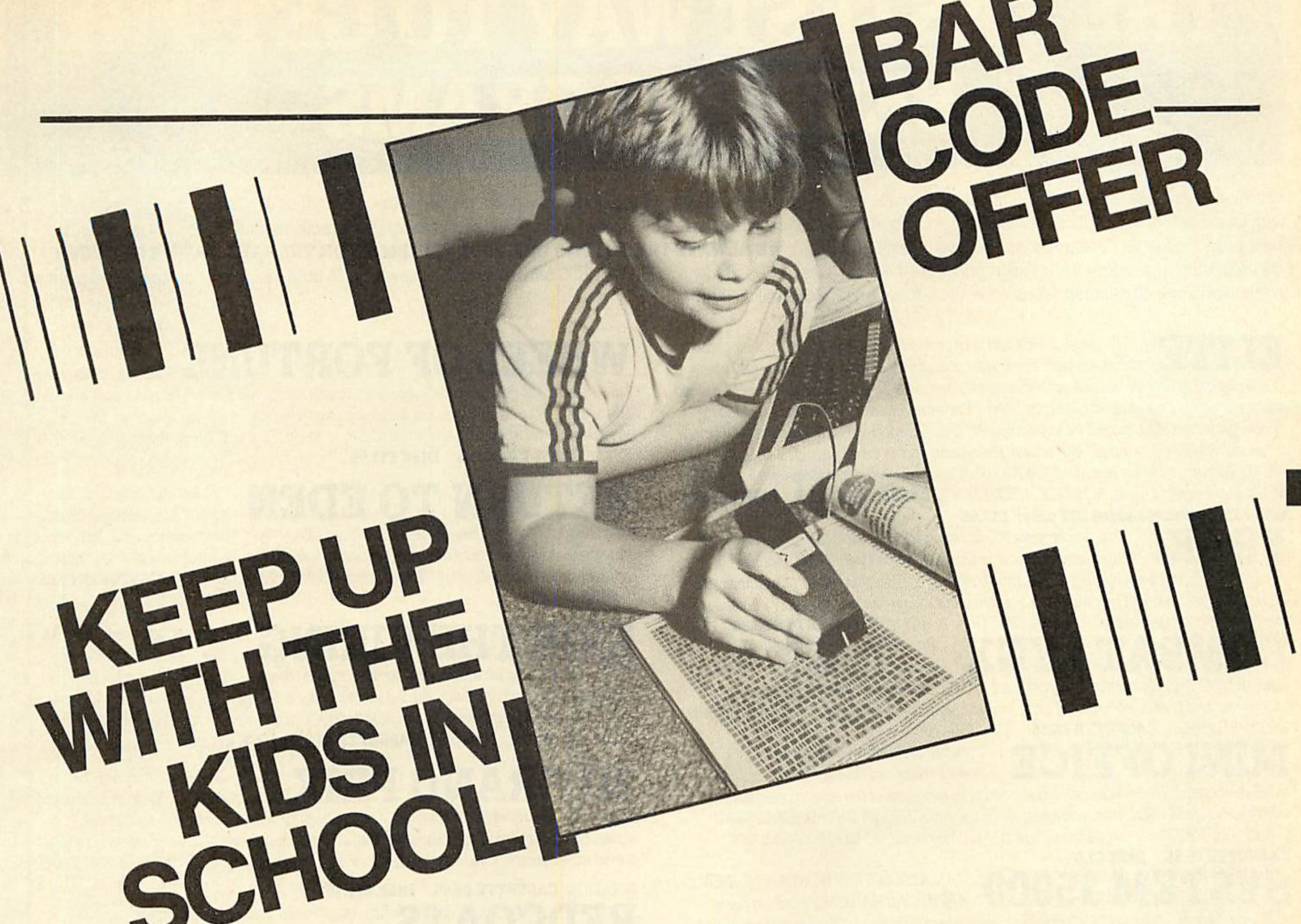
◄ *Continued*

```
430 FOR n=0 TO LEN($com)-1
440 VDU1,com?n
450 NEXT
460 ENDPROC
470 :
480 DEF PROCcol(colour)
490 PROCsend(CHR$(20)+CHR$(colour))
500 ENDPROC
510 :
520 DEF PROCcharacter_set
530 LOCAL base,char
540 FOR base=0 TO 128 STEP 128
550 FOR char=32 TO 127
560 VDU1,base+char
570 NEXT
580 NEXT
590  PRINT'
600 ENDPROC
610 :
620 DEF PROCstyles
630 PRINT"Normal Width ";
640 PROCcol(purple)
650 PROCsend(CHR$(14))
660 PRINT"Double width ";
670 PROCsend(CHR$(15))
680 PROCsend(CHR$(27)+"G")
690 PROCcol(green)
700 PRINT"Elite width    ";
710 PROCsend(CHR$(14))
720 PROCcol(magenta)
730 PRINT"Expanded elite."
740 PROCsend(CHR$(15)+CHR$(27)+"N")
750 PROCcol(black)
760 PRINT
770 ENDPROC
780 :
790 DEF PROCcolours
800 FORcolour=0 TO 7
810 PROCcol(colour MOD 7)
820 READ colour$
830 PRINTcolour$;" ";
840 NEXT
850 PRINT'
860 DATA BLACK,MAGENTA,RED,PURPLE,GREE
N,CYAN,YELLOW,BLACK AGAIN
870 ENDPROC
880 :
890 DEF PROCtab
900 PROCnumber
910 PROCcol(red)
920 PROCsend(CHR$(16)+"020^TAB20"+CHR$
(16)+"045^TAB45")
930 PROCcol(black)
940 PRINT'
950 ENDPROC
960 :
970 DEF PROCnumber
980 LOCAL N
990 FOR N=0 TO 79
1000 PRINT;STR$(N MOD 10);
1010 NEXT
1020 PRINT
1030 ENDPROC
1040 :
1050 DEF PROClinefeed
1060 PROCcol(black)
1070 PRINT"Start of linefeed test. Defa
ult linefeed of 1/6 inch."
1080 PROCsend(CHR$(27)+"B")
1090 PROCcol(green)
1100 PRINT"1/8 inch linefeed, set by ES
C B"
1110 PROCsend(CHR$(27)+"T40")
1120 PROCcol(magenta)
1130 PRINT"1/3 inch linefeed, set as 40
 units of 1/120 inch by ESC T40"
1140 PROCsend(CHR$(27)+"A")
1150 PROCcol(cyan)
1160 PRINT'"Reset to 1/6 inch by ESC A.
"
1170 PROCcol(black)
1180 PRINT"End linefeed test."'
1190 ENDPROC
1200 :
1210 DEF PROCgraphics1
1220 PROCsend(CHR$(27)+"T13"+CHR$(13))
1230 PROCrow(up)
1240 PROCrow(down)
1250 PROCsend(CHR$(27)+"A")
1260 PRINT
1270 ENDPROC
1280 :
1290 DEF PROCrow(direction)
1300 LOCAL colour
1310 FOR colour=0 TO 7
1320 PROCcol(colour MOD 7)
1330 PROCsend(CHR$(27)+"K016")
1340 IF direction THEN PROCtriangle(8,1
,-1,up):PROCtriangle(1,8,1,up) ELSE PROC
triangle(1,8,1,down):PROCtriangle(8,1,-1
,down)
1350 NEXT
1360 PRINT
1370 ENDPROC
1380 :
1390 DEF PROCtriangle(start,stop,step,u
pwards)
1400 LOCAL power,byte
1410 FOR power=start TO stop STEP step
1420 byte=2^power-1
1430 IF upwards THEN byte=byte EOR &FF
1440 VDU1,byte
1450 NEXT
1460 ENDPROC
1470 :
1480 DEF PROCgraphics2
1490 LOCAL count,colour,no_of_bars,barw
idth
1500 no_of_bars=8
1510 barwidth=3
1520 FOR colour=0 TO 6
1530 PROCcol(colour)
1540 FOR count=0 TO no_of_bars-1
1550 PROCsend(FNtab_dot)
1560 PROCsend(FNdot_code)
1570 PROCbar
1580 NEXT
1590 NEXT
1600 PROCsend(CHR$(20)+CHR$(0))
1610 PRINT'
1620 ENDPROC
1630 :
1640 DEF PROCbar
1650 LOCAL dot,byte,basic_byte
1660 basic_byte=2^(barwidth-1)-1
1670 FOR dot=0 TO 12
1680 byte=basic_byte
1690 byte=byte*(2^dot)
1700 byte=(byte DIV 8) MOD 256
1710 VDU1,byte
1720 NEXT
1730 ENDPROC
1740 :
1750 DEF FNtab_dot
1760 LOCAL T$
1770 T$=CHR$(27)+CHR$(16)+CHR$((count*b
arwidth*7+colour*barwidth) DIV 256)+CHR$
((count*barwidth*7+colour*barwidth) MOD
256)
1780 =T$
1790 :
1800 DEF FNdot_code
1810 LOCAL K$,N$
1820 K$=CHR$(27)+"K000"
1830 N$=STR$(barwidth+8)
1840 =LEFT$(K$,5-LEN(N$))+N$
```

Hints & Tips, page 39, listing 1




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This graphic adventure is based on 'The Saga of Erik the Viking' by TERRY JONES. The accompanying 24-page manual contains extracts from the book and contains clues which will help you. As Erik the Viking you travel through over 200 locations in search of the evil Dogfighters who have kidnapped your family. Written by Level 9 but produced by Mosaic. NO STICK. **CASSETTE £9.95 DISK £11.95**

3D GRAND PRIX

You can drive your Grand Prix car around 8 different circuits. (Silverstone is the easiest!) And each race lasts for 3 laps. The graphics are bright and good and the screen-filling dashboard contains a working cockpit: the wheels revolve, the steering wheel moves - the scenery, if you have time to look at it, is very pretty, too! STICKS OK. SOFTWARE INVASION. **CASSETTE £9.95 DISK £11.95**

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This graphic war game (NOT an arcade game or adventure) is set during the American War of Independence. You can choose from 5 different battle zones and, if you wish, you can customize the battles and then title and SAVE your very own battle! 9 skill levels. NO STICKS. LORTHLORIEN. **CASSETTE £6.95**

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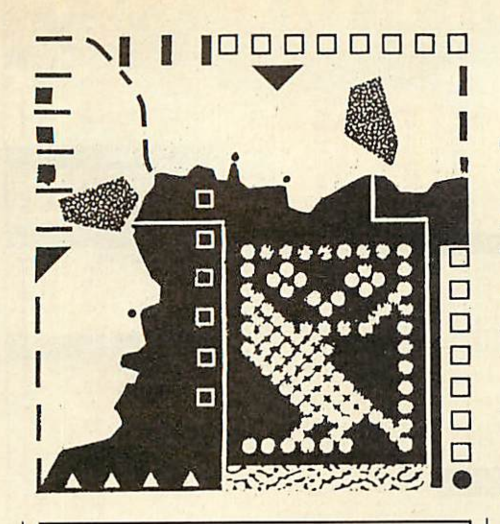
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Among your tips picked by Bruce Smith are how to rewrite programs for a second processor and switch mode without clearing the memory

£20

Print without a prompt

CHATTING to George Hill at a recent *Acorn User* outing to the local hostelry, the conversation inevitably turned to printers. I mentioned that one of the most annoying aspects of dumping listings for use in magazines or books was that there is almost invariably an unwanted > sign either at the top or bottom of the listing, depending on when you sent the terminating <CTRL-C> sequence.

George, as always, got to grips with the problem and a few weeks later this solution appeared on my desk. He explains . . .

The > character can be suppressed by typing:

L. <CTRL-B> <RETURN>

as usual, to cause the listing, and at the end of it type:

<CTRL-A> <DEL> <CTRL-C> <RETURN>

If you wish to send the paper to the top of the next page at the end of the listing, without the intruding > sign type:

<CTRL-A> <DEL> <CTRL-A> <CTRL-L> <CTRL-C> <RETURN>

at the end.

What happens is that at the end of the listing the final line of text is printed, and Basic sends its prompt ">" while the printer is still enabled. This will only be printed when the next carriage return, linefeed or formfeed character is sent to the printer, but it meanwhile lurks in the printer's internal buffer. The <CTRL-A> <DEL> sequence deletes it from the buffer, though not from the screen, and the next characters sent to the printer will arrive in an empty buffer, as they should.

This procedure works on printers such as Stars and Epsons, plus many others where the DEL character (ASCII 127) deletes the last character from the printer's internal buffer.

If your printer (unusually) does not respond to this treatment, there is another possibility. After listing, type <CTRL-C> as usual. Now switch the printer off, then on again. The > sign will have been eliminated from its buffer, and you can proceed to the next listing.

£20

Second processor rearrangement

NO matter what Acorn may say about the use of official MOS calls to keep programs 'tube compatible', they do slow down their operation, and to get an acceptable speed on the Beeb, often the only answer is to use good old fashioned peeks and pokes.

It seems that Acornsoft have found this too, as much of their software addresses memory in all sorts of odd ways to gain speed. The trouble is that as soon as you attach a second processor you increase speed but are also likely to become extremely frustrated as none of your peeks and pokes will work, due to the rearrangement of the Beeb's memory map.

Bob Sparkes of the University of Stirling, spurred on by Robin Newman's article on the second processor in the August 1984 issue of *Acorn User*, has come up with some interesting procedures allowing programs to be rewritten with the minimum of fuss. Bob explains . . .

To each program I add the procedures in listing 1 (if you want to know why they work see Robin's article).

PROCmovecode is called immediately after assembling the code (or after loading with *LOAD). It transfers the code from the memory of the second processor to the identical addresses in the I/O processor (ie where it used to live before the second processor was around).

```
8000 DEF PROCpoke (addr,data)
8010 !block%=addr:?(block%+4)
     =data
8020 A%=6:X%=block:Y%=X%
     DIV 256:CALL & FFF1
8030 ENDPROC
8040 :
8050 DEF FNpeek (addr)
8060 !block%=addr
8070 A%=5:X%=block%:Y=X%
     DIV 256:CALL & FFF1
8080 =?(block%+4)
8090 :
8100 DEF PROCcall (addr)
8110 PROCpoke
     (&200,addr MOD 256)
8120 PROCpoke
     (&201,addr DIV 256)
8130 A%=136:CALL &FFF4
8140 ENDPROC
8150 :
8160 DEF PROCmovecode
8170 FOR M%=start% TO P%-1
8180 PROCpoke (M%,?M%)
8190 NEXT
8200 ENDPROC
8210 :
```

Listing 1. Bob Sparkes' procedures to allow programs to be easily rewritten for a second processor

PROCcall(mycode) causes the machine code routine at the address 'mycode' to run in the I/O processor. Here it can access the screen memory, user port, etc directly, with no loss of speed because it isn't having to go up and down the tube. It's also easier than asking SHIELA to do the job!

The statements to do this are as follows – they assume that PROCassemble creates code at the address 'start%' upwards (which has to be declared initially). I have chosen &4000 for this, but clearly the exact address depends on the particular application.

```
1 HIMEM=&4000
2 MODE 4
3 DIM block% 4
4 start%=&4000
5 PROCassemble
6 PROCmovecode
7 PROCcall (start%)
```

page 119 ▶

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

◀ page 117

```
10000 DEF PROCassemble
10010 P%=start%
10020 REM assembler
      listing
10030 REM etc..
10040 :
10050 :
10060 :
10070 ENDPROC
```

Similarly, any program that contains a direct memory statement, say to the user port, can be replaced by one of the following:

Replace ?&FE60=N with PROCpoke (&FE60,N)

or

Replace X=?&FE60 with X=FNpeek (&FE60)

I now have a second processor *and* all the machine code programs I wrote without it. Well done Robin, your article is pure genius!...

Does anybody else have any interesting procedures or functions? Keep them short, but most importantly keep them original!

£5 Screen mode switch routine

A USEFUL routine allowing the user to switch between screen modes without corrupting memory has been provided by Jonathan Millar of St. Catherine's College, Oxford, who sets the scene ...

I recently found it necessary in writing a program to go from mode 2 to mode 7 and back again, while preserving the mode 2 screen. After failing to produce a successful machine code program to set up the 6845 and the operating system variables I resorted to seeing what the OS 1.2 ROM had to offer.

At &CB1D I discovered the routine which carries out the mode (VDU 22) instruction. The accumulator holds the mode number on entry and, as far as I can discern, the routine completely mimics the mode instruction.

From &CB1D to &CBEF the routine sets up the operating system variables and the 6845 to the desired mode, and then, at &CBF0, the routine clears the screen memory.

This routine to change modes without clearing the screen memory, is a simple matter of transferring the routine to RAM, and inserting an RTS just at the point when the memory would be cleared.

Listing 2 will do this and then demonstrate its application by using mode 2, then mode 7, and reverting to mode 2.

The use of mode 7 will, of course, corrupt the bottom two lines of the mode 2 display (from &7C00 to &7FFF) and this area has therefore been saved in the region of memory between &2B00 and &2F00...

As I said, a useful routine, although it's dependent on the 1.20S to function as it copies code from within. I should think that it's almost impossible to do it 'legally' – unless you know otherwise, of course!

```
 10 REM Switching screen Modes
 20 REM by  Jonathan Millar
 30 :
 40 FOR N%=0 TO &D2
 50 N%?&2F00=N%?&CB1D
 60 NEXT
 70 ?&2FD3=&60
 80 MODE 2
 90 PRINTTAB(2,10)"THIS IS MODE 2"
100 TIME=0
110 REPEAT UNTIL TIME=200
120 REM Preserve &7C00 to 7FFF
130 FOR N%=0 TO &3FC STEP 4
140 N%!&2B00=N%!&7C00
150 NEXT
160 VDU 22,7
170 PRINTTAB(12,10)"THIS IS MODE 7"
180 TIME=0
190 REPEAT UNTIL TIME=200
200 REM Bck to MODE 2 display
210 A%=2 : CALL &2F00
220 REM Restore  &7C00 TO &7FFF
230 FOR N%=0 TO &3FC STEP 4
240 N%!&7C00=N%!&2B00
250 NEXT
```

Listing 2. Jonathan Millar's routine to switch screen mode without corrupting memory

£5 Painless marker removal

MANY readers were obviously delighted with the method of deleting *Wordwise* markers presented in December's Beeb Forum. Martin Wax sent me his simple but effective answer to this problem ...

My painless way of removing *Wordwise* markers is, after going to the start with SHIFT-↑: f4, f3, CTRL-A, f4, f3, CTRL-A.

f3 puts the marker as the 'specified character' for f4.

To get the cursor back to its original position, I type a character, usually @, before the above procedure and then use f4, @ (preceded by SHIFT-↑ if necessary) to get back to it. CTRL-A will remove @ to return to normal.

£5 Mode 7 one-liner

FOLLOWING the one-line screen dumps presented in earlier Beeb Forums, Ian Waugh of Sunderland completes the set by offering one for mode 7.

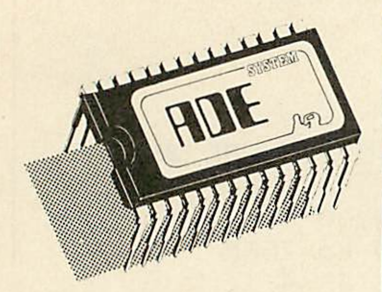
The dump cannot translate teletext control codes or double-height characters, so these are skipped over by Ian's program – no doubt someone can come up with a suitable one-line solution.

```
   10*KEYO V.2,1,27,1,81,40:F.A=&7C00TO&
7FEF:B=?A:IFB<32ORB>126 V.1,32:N.EL.IFB=
35 V.1,27,1,82,1,3,1,35,1,27,1,82,1,0:N.
EL. V.1,B:N.:V.3!M
```

Ian Waugh's one-line screen dump for mode 7

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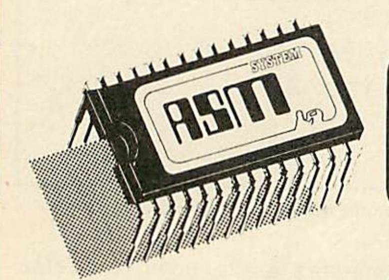
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In all SPY2 has a comprehensive set of 23 utility commands. These are supported by an excellent Reference Manual.

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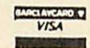
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WHAT ACORN DON'T TELL YOU ABOUT THE Z80

Robin Newman reveals some of its secrets

FIRST let me answer my own question posed in the October 1984 Beeb Forum. There is indeed a call which enables you to determine the version of Network Filing System (NFS) software running in the local machine. It uses OSARGS with A set to two and Y set to zero. On exit A=2 for NFS 3.34 or 1 for NFS 3.40 or greater.

The information is published by Acorn in their *Advanced Econet User Guide* which is now supplied with new Econet machines, but I was unaware of its existence until the end of July! It contains other useful information for those wishing to dabble in Econet utilities. It's easier to follow than the original *Econet User Guide*, although not detailed enough in places, eg, when explaining the file server interface OSWORD call &14.

Listing 1 shows the start of the BUILD utility discussed in the October issue, suitably altered to use this call. I received another neat way of overcoming the problem of using OSARGS with A=1 with different NFS versions from Felsted School, which is shown in listing 2 for comparison.

Recently, I have gained access at work to the Z80 second processor. There are others better suited to comment on the wealth of software packages supplied with it, but perhaps the following observations may be of interest.

First, what Acorn don't tell you. If you push Break with the second processor installed, then you revert to the no language environment (NLE). Code from the Boot ROM is copied to &F000 and the second processor is executing an input with this code, awaiting a command from the user. If you now type *HELP (actually the * is not necessary), you will see the Boot ROM (called Acorn Tube Z80 64k 1.20) listed along with the other ROMs in your machine. Note that the word MON is listed underneath it, in the same way that the words DFS and UTILS are listed underneath the DFS 1.20 heading. This indicates that HELP MON will bring a further response. Sure enough, typing this in produces a list of commands that the Boot ROM will respond to:

CPM
Dump <start address> <end address>
GO <address>
Set <start address>

The first initiates the booting process to lead CP/M (as does ctrl Break). The GO command starts executing code from the following address. The Dump and Set commands Dump and Alter or Set memory locations directly. They use only the first letter of each command, eg, D 1000 1050 would dump hex 1000 to hex 1050 with ASCII interpretation. S 1000 (Return) displays the current contents of &1000. Typing in a new two digit number in hex alters this. Use Return to exit if only one location is to be altered, cursor up to step to the next location or cursor down to move back in memory to the previous location. These commands are *only* available in the no language environment, and typing *HELP MON from Basic does not list the commands.

Another area not adequately covered (despite 11 manuals!) is how to send *FX calls to the operating system – to set up a serial printer, for example. The technical appendix J at the back of the CP/M 2.2 manual – rather an obscure place to hide it – says that OSBYTE calls can be used to do this using the STAR command. This turns out to be a file STAR.COM on the utilities disc. Typing STAR <return> produces a * prompt, and you can then type FX5,2 <return>, FX6,0 <return> etc, getting back to the command mode with a ctrl C. This has to be found out by trial and error, and should have more detailed documentation. One drawback is that you must remember to do this selection before entering one of the application packages, otherwise you'll have to return to the command mode in order to use STAR.COM. Of course from Z80 BBC Basic you can use *FX calls directly, as for the 6502 version.

The Z80 version of BBC Basic turned out to be easy to use after its 6502 version, and the differences were well documented. From a technical point of view PAGE is set to &3B00, above Basic which resides from &100 to &3AFF. HIMEM is &DC00 in all modes. Program lines are stored in a slightly different formation from the 6502.

The specimen Basic program (listing 3) is shown as stored in 6502 Basic (figure 1) and Z80 Basic (figure 2). In figure 1 the line terminator (&D) is followed by the two byte line number (hi-byte followed by lo-byte), and then the offset from one terminator to the next line. In figure 2 the offset comes immediately after the terminator and is followed by the line number, with the bytes in reverse order (lo then hi). Notice also that the initial terminator is missed out.

At the end of the program the 6502 byte following the last terminator is set to &D and the following byte is 'TOP'. In the Z80 version the offset byte following the last terminator is 0 and both line number bytes are set to &FF, the next byte being 'TOP'. Thus the Z80 program is one byte longer.

A CP/M file DIP. COM is supplied which allows you to transfer Basic programs from a CP/M disc in Z80 format to a DFS disc in 6502 format, and vice-versa. I also found it useful (and often more convenient, as it avoided leaving Z80 Basic) to put a DFS disc in drive one of my dual drive and to *SPOOL Z80 files to the DFS disc. Unfortunately this

See yellow pages 105 to 106 for Robin Newman's listings and figures 1, 2 and 3

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cannot be done easily in reverse.

The third memory dump (figure 3) shows what happens to the Z80 program when it is operated on by the CP/M file UNLIST. COM. This renders the program unlistable, but runnable. The effect is to set all line numbers to 0 (an invalid line number for Z80 Basic) apart from those lines which are the target of a GOTO / GOSUB command; (eg, lines 60 and 70 in the example used). This explains why this protection method cannot be used for programs with computed GOTO / GOSUB line numbers, as these may be set to zero!

One major defect with the Z80 system was the vulnerability of the Break key. With a stand-alone Beeb, it is relatively easy to retrieve the situation when Break is accidentally pushed (unless you have a disc program relocated to &E00, or a program protected with *FX200,3), but with the Z80 version you lose Basic and return to the NLE.

This is also true when using one of the application packages, eg, *Memo Plan*. If I was using these in a business environment I would want to have the Break key disabled by breaking the link on the keyboard, and install another switch on the back of the computer, out of harm's way.

I found Basic itself remained intact, and could be re-entered at its warm start address using GO 103 <return>. This was OK until I attempted to use the disc to save or load a program, when the system hung. This was because the Boot ROM locates its image at &F000 on top of the top end of the BIOS code, and the buffer containing the disc directory, when the Break key is pushed. Thus it seemed necessary to reload CP/M from disc before re-entering Basic.

At this stage I typed in a Basic memory-inspect program, and dug out an excellent disassembler written by Dave Parkinson, published in *PCW* in 1979. This had previously served me well on a Nascom 2, and sure enough it performs excellently on the Beeb. With the aid of these tools I have produced the patch program shown in listing 4. This intercepts the reload process for CP/M initiated by the Boot ROM, and instead of jumping to the CCP upon completion, it does a warm start back to Basic.

The only drawback is you have to lower HIMEM to &D300 instead of &DC00, thus limiting your maximum program size to 38k instead of 40.25k, but who's complaining after the restraints of a stand-alone Beeb?

Note also that it's necessary to type *FX229 upon re-entry to Basic to re-enable the Escape key which is disabled during the CP/M loading process. One nice point is that on re-entry to Basic variables will still retain their old values.

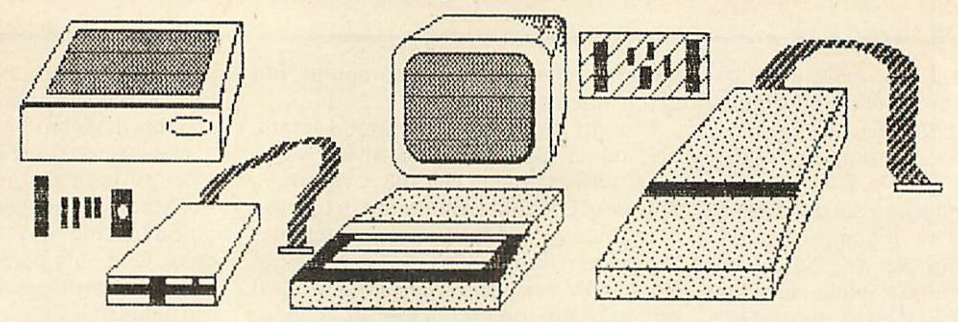
When ctrl-Break is pushed, the Boot ROM image is loaded, and then code is called to load CP/M from disc. Control then passes to the BIOS which initialises and then finally jumps to the CCP.

The patch program works in two stages. First it intercepts the jump address from the Boot ROM to the BIOS to return control to itself (lines 120 to 150), and then it jumps to the *CPM entry point in the Boot ROM code (&F4CF).

When control passes back to the patch (line 180), the CP/M image has been loaded, and the patch now overwrites the jump from the BIOS to the CCP, so that control passes to the Basic warm start entry at &130 once the BIOS has initialised (lines 180 to 210). Finally the patch exits by jumping to the BIOS cold start entry (&EA00).

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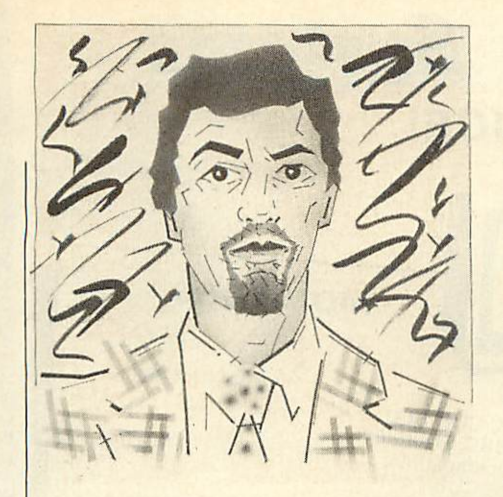
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Paul Beverley takes you to the back of your micro to explain how the analogue port works, then uses it to provide a set of switch inputs

ANALOGUE PORT APPLICATIONS

THE analogue port is the 15-way connector on the back of the computer which can be used for joysticks. However, there are a whole host of other possible applications for this interface. In this and succeeding articles I'll look at a number of them in some detail and give suggestions of other simple interfacing projects you could try. My aim is to provide something interesting for the home computer user looking for an alternative to playing games, but the projects also have a tremendous educational value. I hope schools searching for projects which children can undertake without a great deal of technical knowledge will find this series helpful.

Those of you who saw Sue Kingsbury's excellent article 'Zoo Time for Micros' in the August issue might well have felt that if interfacing was that simple they might 'have a go'! Well, I'll follow on from there and show just how simple, creative, educational and plain good fun interfacing can be. You won't need any electronics knowledge to do at least the first few projects. The later ones will have full instructions, so you won't need to understand how the electronics bits actually work, but I'm sure you will find that you learn some electronics as you build them.

I'll start by looking at the principles on which the analogue port works, then go on to show how to use the analogue input to provide a set of switch inputs, which could, for example, replace the user port in Sue Kingsbury's activity board. This will make the hardware even cheaper and allow you to use more than eight switches. The same technique could be adapted for a whole range of other applications.

If you want to get on and try making this month's project, then you could skip over the explanation of the theory, but it's useful to understand what's going on. If you know at least a little about how it works, it will be easier for you to adapt this and succeeding projects for your own applications. Read through the theory as far as you can, and when you feel that it's getting too deep for you, skip on to the project section. Then come back to the theory and try again when you have seen it in action.

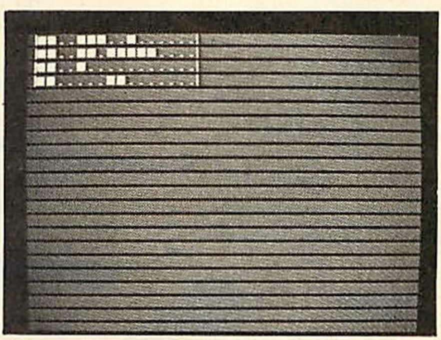
How does it work?

The information inside the computer is dealt with in terms of ons and offs, in other words, the binary system. Such quantities are referred to as *digital*. Indeed the micro is what we call a 'digital computer'. However, quantities in the outside world are not all simple ons and offs. Many quantities can take on a whole range of possible values. These are referred to as *analogue* quantities.

To illustrate this let's compare two different ways of controlling a room light. We could use a simple switch which makes the light either on or off – this is digital control. Alternatively we could use a dimmer control which allows us to set the light level anywhere between the maximum light and complete darkness. This is analogue control.

If we have analogue quantities which we want the computer to sense, then we need a device to turn them into a digital number. Such a device is referred to as an analogue to digital converter (ADC).

The ADC used on your micro has four separate channels and can therefore read the value of each of four voltages applied to it. It takes a certain length of time for an ADC to work out the digital value of the analogue voltage applied to it. In this case it is 10 milliseconds or one hundredth of a second for each channel. This may not sound very long, but in computer terms a lot can happen during that time. The microprocessor at the heart of the computer has a 'heart-rate' of two million beats per second, so it can obey thousands of simple instructions in the time it takes the ADC to measure the voltage on a single channel. We would say therefore that this was a 'slow' ADC. A fast ADC costing a few pounds can convert a number in a matter of ten microseconds, and there are some ADCs, referred to as 'flash converters', which can convert in a tiny fraction of a microsecond, but these are expensive and not really suitable for our simple projects!



Listing 1 represents the binary numbers being produced by the ADC as white blocks on the screen

Reading the ADC values

Within Basic is the ADVAL command which, as the name suggests, is used for reading the values the ADC produces. It is also used for a number of other purposes, but this is its main function. If we want to know the value of the latest conversion on any of the four channels we simply say:

```
PRINT ADVAL (1)
```

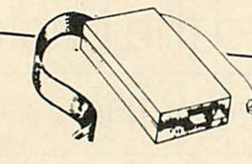
The number in brackets is the channel we want to check. We can also store this value in a variable by saying, for example:

```
value% = ADVAL (2)
```

We do not have to use an integer vari-

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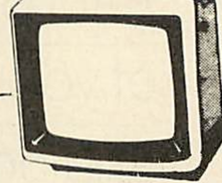
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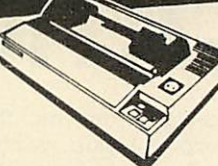
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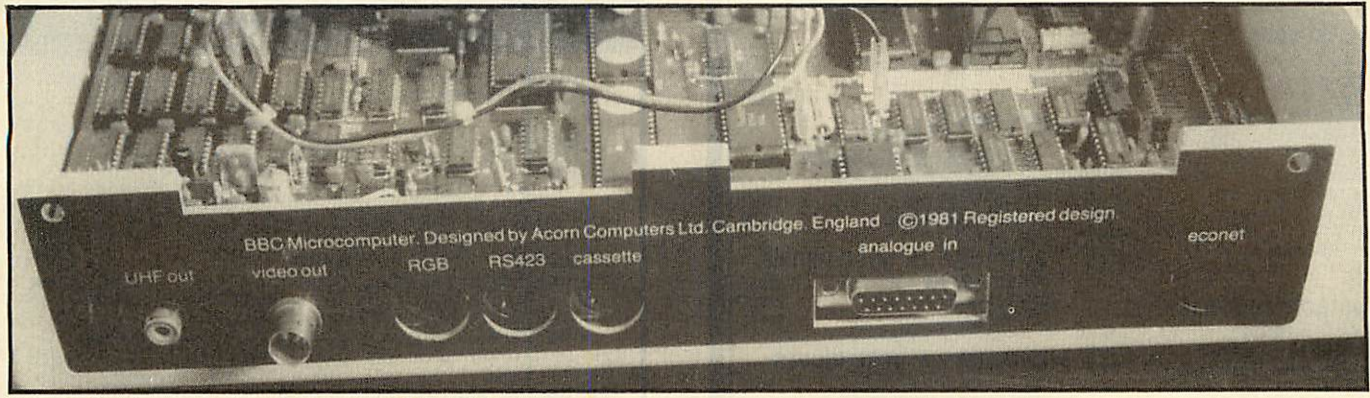
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Where to find the analogue port on the back of the BBC micro

able, ie one with a % sign following it, but we might as well since the value produced is always an integer.

ADVAL returns a value which is actually a 16-bit binary number, although of course Basic will print it out in decimal for you. The number which the ADC provides is in fact only 12 bits – the bottom four bits have all been made equal to zero. The number we get therefore goes up in steps of 16 from 0 to 65520 (binary 1111 1111 1111 0000, hex &FFF0).

Therefore, if we divide the ADVAL value by 16 we get a number between 0 and 4095 (binary 1111 1111 1111, hex &FFF). If you want to have a look at some of these values enter the following line:

```
REPEAT PRINT ADVAL (1)/16 :
UNTIL 0
```

This will produce a sequence of seemingly random numbers because the ADC input is very sensitive. If nothing is connected to it, it picks up electrical interference both from the computer itself, and any other devices nearby.

To see just how sensitive it is, place your finger close to the 15-way connector at the back of the computer, and you'll notice that the numbers produced change in response to the movement of your finger. It is this very sensitivity which makes it a useful interface in so many of the applications we are going to be looking at.

If you have a joystick, plug it in and use the same command to see the difference it makes. You'll find that there is still some variation in the value being produced – not as much as before, but you certainly don't get a steady value. Don't send your computer or your joystick back to the manufacturer though! It's a sad fact of life that the ADC chip, although it produces a 12-bit number, is really only accurate to nine or 10 bits. Now try:

```
REPEAT PRINT ADVAL (1) DIV 128 :
UNTIL 0
```

This will return a nine bit number between 0 and 511 (binary 1 1111 1111, hex &1FF). If it still shows a lot of variation, consult your local dealer! The reason for changing from '/' to 'DIV' for the division is that we want it to return an integer. We are not interested in any figures after the decimal point. In fact, ADVAL (1) DIV 128 is equivalent to INT (ADVAL (1)/128), but it is quicker using DIV. We could use / when dividing by 16 because the bottom four bits were zero anyway.

For most applications in this series these inaccuracies will not be significant. Even using nine bits gives over 500 levels which we can detect in our program, and this is more than adequate for many purposes.

If you want greater accuracy, you can refer to an article in the March issue of *Acorn User* in which I explained how to set up some automatic averaging routines working in machine code. These allow you to select the desired accuracy using an FX call and simply wait until the averaging has been done before reading the new ADVAL value that has been returned.

Speeding things up

As the ADC is relatively slow, we may want to speed it up for some applications.

First, if we are not using all four channels, we can disable those not in use so that it doesn't waste time converting those voltages. *FX 16,1 will enable only the first of the four channels, *FX 16,2 will enable channels 1 and 2, and *FX 16,3 will enable all except channel 4. When you first switch on the computer all four channels are enabled (the equivalent of doing a *FX 16,4), so the onus is on you to switch off any you don't want to use.

The other way to speed things up is to switch the ADC chip from the 12-bit mode into the 8-bit mode. This means that it takes only 4 milliseconds per channel to do the conversion instead of 10 milliseconds, but also means that you only get an 8-bit number instead of a 12-bit number. Thus you would use:

```
value% = ADVAL (1) DIV 256
```

which would return a number between 0 and 255 (binary 1111 1111, hex &FF).

To switch to this mode you use *FX 190,8. To switch back again use *FX 190,12 or *FX190,0 or even just *FX 190 which all have the same effect. In fact this mode is very rarely used because the inaccuracy mentioned earlier is equally bad in it. The two or three bit variation also occurs here, so you end up with the equivalent of a five or six bit converter! Thus what we gain in speed, we lose in the accuracy of the value returned.

```
 10REM Viewing ADVAL binary
 20REM by Paul Beverley
 30REM for BBC & Elk Plus1
 40REM (c) Acorn User
 50MODE 6
 60PROCinitalise
 70REPEAT
 80VDU 30
 90C$=INKEY$(0)
100IF C$="8" THEN *FX190,8
110IF C$="0" THEN *FX190,0
120IF C$="1" THEN *FX16,1
130IF C$="2" THEN *FX16,2
140IF C$="3" THEN *FX16,3
150IF C$="4" THEN *FX16,4
160FOR N%=1 TO 4
170PROCdisplay(ADVAL(N%))
180NEXT
190UNTIL 0
200END
210:
220DEF PROCdisplay(M%)
230T%=&8000
240PRINT CHR$(252);
250FOR H%=1 TO 16
260IF (M% AND T%) VDU 255 ELS
E VDU 254
270T%=T%/2
280NEXT
290PRINT CHR$(253)
300ENDPROC
310:
320DEF PROCinitalise
330VDU19;4;0;23;10,32,0;0;0;
340N=1
350VDU23,252,N,N,N,N,N,N,N,N
360N=128
370VDU23,253,N,N,N,N,N,N,N,N
380N=126
390VDU23,254,0,0,0,0,0,0,24,0
400VDU23,255,0,N,N,N,N,N,N,0
410ENDPROC
```

Listing 1. Looking at the binary numbers produced by the ADVAL function

Using *FX 190,8 produces a 10-bit conversion with the eleventh and twelfth bits set to 1 and the bottom four bits to 0 as before. ADVAL therefore returns a value between 48 and 65530 in steps of 64 (binary 0000 0000 0011

0000 to binary 1111 1111 1111 0000).

If you want to see the binary numbers that are being produced by the ADC then you can run listing 1. This gives the 16-bit binary numbers for all four channels as white blocks on the screen, so you can see which bits are changing in response to the noise and interference. If you press the number 8 key the computer will switch over the ADC to an 8-bit conversion. Pressing the zero key will switch back to the normal 12-bit conversion. Keys 1 to 4 allow you to select the number of channels being viewed.

Project – the ADC as a switch input

It may seem a silly idea to use the ADC input to provide a digital function – checking which of a number of switches has been pressed. In fact if speed is no problem, it is cheaper and more versatile than using the user port.

The basic idea of the hardware is shown in figure 1. It consists of a chain of equal value resistors which divide the reference voltage into equal voltage steps with a variable resistor at the top to give some degree of adjustment if required. These different voltage steps can be connected into the computer by the switches S1 to SN. You could have 10 or a dozen switches, or just as easily 100 or more (if you could afford them!).

The value of the resistors is not particularly critical, but as a rule of thumb you should have the total resistance equal to round about 10k or so. If you needed 10 or 12 switches you could use, say, 1k resistors. The 470k resistor makes sure that when none of the switches are closed, the input is not left unconnected since this would produce interference.

One reason this method is better than using the user port is, of course, that you can have so many switches on the one input. Another advantage is in terms of cost. You can buy a 15-way D-type connector with solder terminals for about £1.50, whereas a connector plus ribbon cable for the user port is about £3 or so. Finally the number of lines linking the computer to the equipment is reduced so you can have the switches much further from the computer. The cable can be any old three core wire provided it is less than about a metre long. For longer runs twin screened cable would be better.

Software and applications

The applications of this basic idea are multifarious! In the December issue of *Acorn User* an organ project with this principle was presented in 'Joe's Jottings'.

The aim of the function FN_ADC(K%) below is to wait until the divided down ADVAL value is stable (the same value three times in a row) before returning the value.
510 N% is used to set the number of times the value has to be the same.
520 Loop starts here.
530 Wait for a conversion on channel 1.
540 Get the number and divide by the scaling factor K%.
550 If the value is different from the last one, reset N% to 2 and take this as the new value of U%. Otherwise decrement N%.
560 Keep going until N% = 0.
570 Return the value from V%.

```
500 DEF FN_ADC(K%)
510 LOCAL N%:N%=2
520 REPEAT
530 REPEAT UNTIL ADVAL0
    DIV 256=1
540 V%=ADVAL1 DIV K%
550 IF V%<>U% N%=2:U%=V%
    ELSE N%=N%-1
560 UNTIL N%=0
570 =V%
```

Listing 2. The function FN_ADC

Some of you may already have a switched joystick from another computer and want to use it on your micro. Listing 2 provides a suitable function, FN_ADC, to put into your program to return a number which will tell you in which direction the stick has been moved.

The next idea is a hexadecimal keypad. For this you would either have to write the 'FN_ADC' function into your own program or, if you are a more experienced programmer, write an event (interrupt) routine which checks if the ADVAL value exceeds the minimum value and then enters a character directly into the keyboard input buffer.

You can of course adapt Sue Kingsbury's activity board using reed switches fastened to the underside of a board actuated by a magnet or magnets inside a model on top. There are lots of games applications using the activity board idea.

You could have a basic board with cardboard overlays for different snakes and ladders type games. The list of ideas is endless.

If you want lots of contacts and can't afford reed switches, a simple and cheap alternative is to use drawing pins. They can be hammered through a piece of hardboard with the resistors soldered underneath. Four people could each have a heavy object with a metal bottom wired up to one of the ADC inputs which can sit on any one of the drawing pins. You could have a hundred pins with a hundred resistors and a connector and still get change from £5.

Next month I'll give you a program using interrupts for the hexadecimal keyboard idea. This will actually be programmable so that you can select which characters are produced by each of the individual keys.

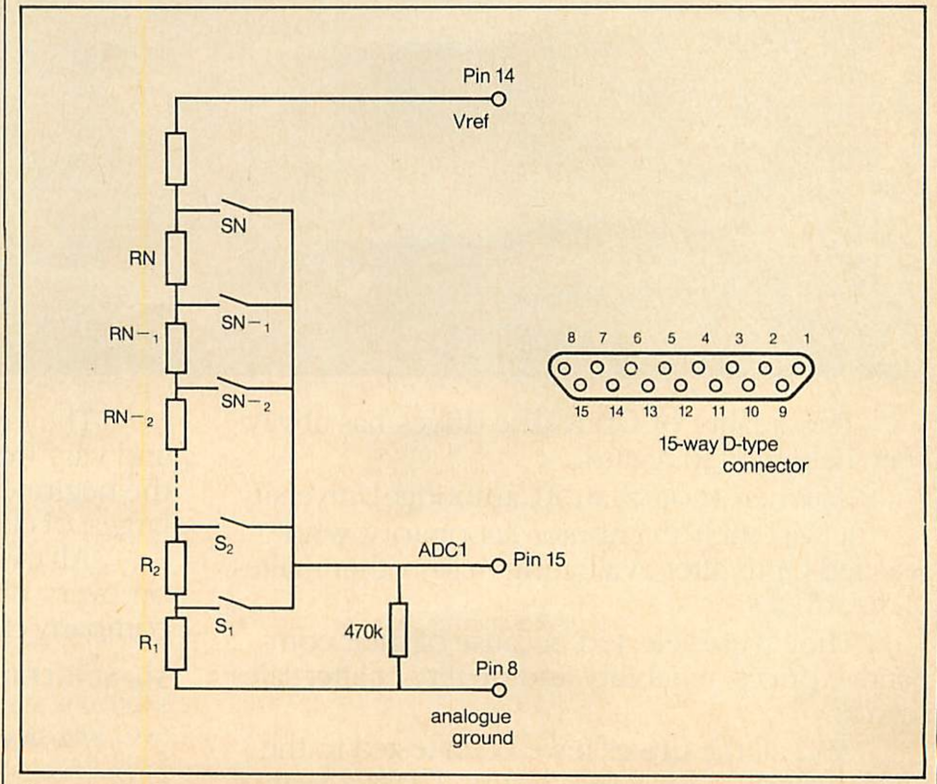
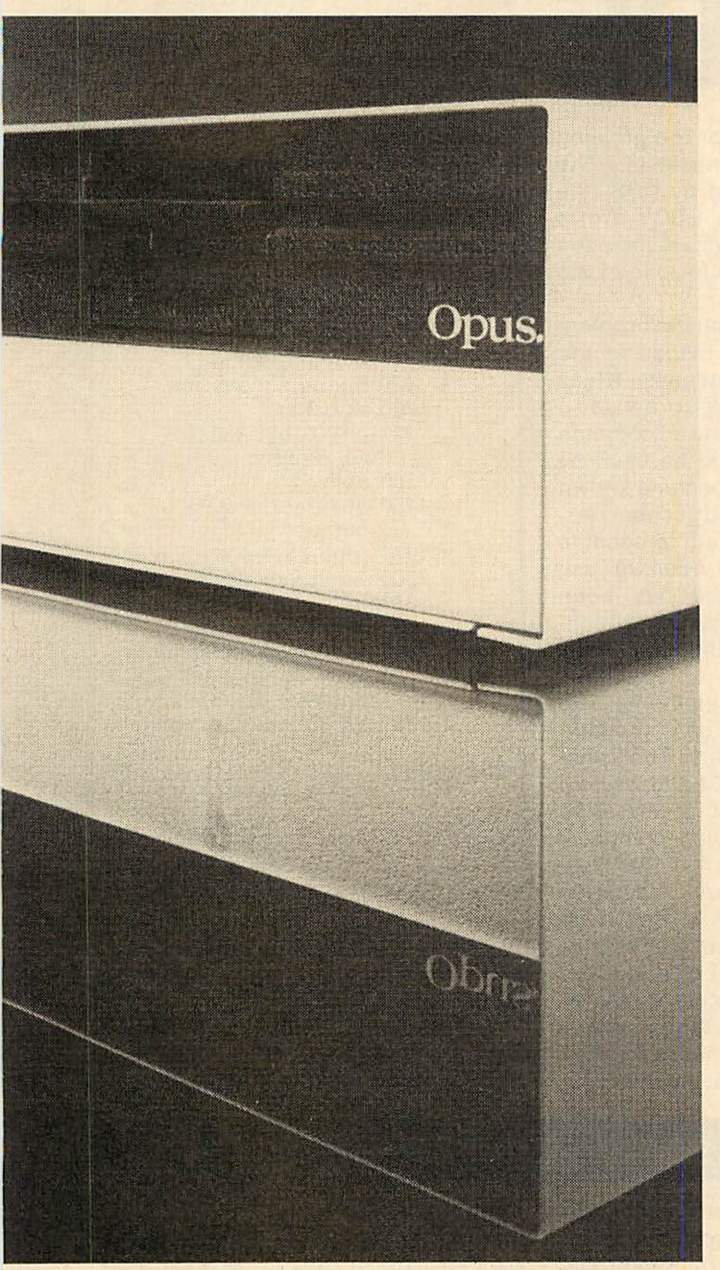


Figure 1. Hardware necessary for a simple switch-type input on the ADC

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ATOMISING BASICODE

Barry Pickles gives the background, then G R Spray makes it work with the Atom

WHEN Basic was first devised at Dartmouth College 20 years ago it was never envisaged as an all-purpose language. However, with the development of large scale integrated circuits (silicon chips) and the advent of the microcomputer, Basic was seen as an easy-to-use first language – and, more importantly, as easy to implement. Unfortunately, in order to cope with the increasingly sophisticated facilities provided on micros, each manufacturer has 'enhanced' Basic in his own way, so there are now many 'dialects' of the original language, all only partly compatible with each other. Perhaps the most extreme example was Atom-Basic, which, although very powerful, was so different that it almost constituted a new language.

ABS AND ASC ATN CHR$ COS DATA DIM END EXP FOR GOSUB GOTO IF INPUT INT LEFT$ LEN LET LOG MID$ NEXT NOT ON OR PRINT READ REM RESTORE RETURN RIGHT$ RUN SGN SIN SQR STEP STOP TAB TAN THEN TO VAL

Table 1. Basicode keywords

In this climate the Dutch radio network began broadcasting in 1979 a series of programmes for the growing number of micro enthusiasts. The series was soon carried by NOS (the Dutch equivalent of the BBC's World Service) and each broadcast included a software transmission for one of the popular micros.

It was soon realised that the problem of incompatibility was hindering the effectiveness of the broadcasts. Klaas Robers, a Dutch enthusiast, proposed a common language with a common cassette OS, which could be used by several machines. This became known as Basicode. Later he and Jochem Hermann improved the system to become Basicode-2, which has been in use since January 1983 and has been adopted by the BBC for its regular software transmissions in the *Chip Shop* programmes.

Basicode-2 has three elements. The language itself is based on a common subset of Basic (see table 1). The transmission of code is at 1200 baud, using a protocol similar to that of the BBC micro, and each receiving computer must use a software patch to modify its own COS. The third element is a series of common sub-routines to deal with the problem of different micros performing such tasks as clearing the screen, positioning the cursor, etc, in various ways (table 2). When called, these perform the same tasks, but the code is specific to the host machine.

To implement Basicode-2 on the Beeb or Electron you need a kit which is available from the BBC at £3.95. It contains a manual and the translation program for each of the popular micros.

100:	clear screen; home cursor
110:	move cursor to x, y
120:	find cursor position
200:	INKEY$
210:	as 200, but waits for keypress
250:	bell
260:	generate random number
270:	report bytes free
300:	convert number to string
310:	as 300, but with formatting
350:	output string created by subroutines 300/310 to printer
360:	as 350, but followed by < CR >
20000-24999:	user subroutines specific to host machine
25000-29999:	DATA statements
30000-32767:	REM statements

Table 2. Basicode standard subroutines

The Atom is not included among these, but we show you how to implement Basicode on it below.

The Basicode-2 kit is available from Broadcasting Support Services, PO Box 7, London W3 6XJ.

ROUTINES FOR DOWNLOADING BASICODE, by G R Spray

THIS program (listing 1) enables the Atom to load Basicode programs as transmitted by BBC Radio 4, and converts the data to a listing in the lower text space.

Basicode is transmitted at 1200 baud. A modification to the OSBGET vector substitutes a suitable routine and restores the vector to normal at the end of loading. Bytes are transmitted with the most significant bit (MSB) set, which is then marked out by the computer to restore them to their correct ASCII character values. Data is proceeded by a Start byte, #82 (=#02 STX). The end of program line marker is #8D (=#0D CAR.RET.), and the last Byte is #83 (=#03 ETX).

Line numbers are transmitted as ASCII characters, so use of the checklist routine to verify correct loading will produce incorrect line numbers at this stage.

The Translate and move routine corrects for the STX and ETX characters. It places #FF at the end of text, and converts the line numbers to their correct binary values. The program may then be listed as normal. Some translation is also affected to change the statement delimiters from : to ; and substitute the print statements ; with a space.

The machine code is located at #96C0 to leave maximum space for the data to be stored from #8200 onwards, but may be relocated by changing the value assigned to M.

Load routine

Line 60 uses a routine labelled BB0 to set OSBGET to operate at 1200 baud, and the #FC4F is called to print the message 'PLAY TAPE'. Line 70 uses the OS routine of #FFD4 to get the byte, sets the MSB to zero and stores the data in the graphics memory area. Line 90 checks for the CTRL key to end loading, as the ETX marker is not recognised by the Atom.

Checklist

Lines 110 and 120 look for #0D followed by #03 to end Checklist branching to Lines 130 and 140 to output to screen or generate CR/LF as required.

Line 160 checks for the CTRL key to terminate.

```
   10 PRINT$12"      atom-basicode"'''
   20 @=0;PRINT"PLEASE WAIT....."''
   30 DIM BB8,NN16;M=#96C0
   40 FORI=0TO16;BBI=M;NNI=M;NEXT
   50 PRINT$21;FORI=1TO2;P=M
   55 REM LOAD ROUTINE
   60 [LDA@0;STA#82;LDA@#82;STA#83;JSR B
B0;JSR#FC4F
   70 :NN10 JSR#FFD4;AND@#7F;LDY@#0;STA(
#82),Y
   80 INC #82;BNE NN11;INC #83
   90 :NN11 LDA#B001;AND@#40;BNE NN10;JS
R BB8;RTS
   95 \ CHECKLIST ROUTINE
  100 :NN12 LDA@#01;STA#82;LDA@#82;STA#8
3;LDY@0
  110 :NN13 LDA(#82),Y;CMP@#0D;BNE NN14;
INY;LDA(#82),Y
  120  CMP@#03;BNE NN15;RTS
  130 :NN14 JSR#FE55;JMP NN16
  140 :NN15 DEY;JSR#FFED
  150 :NN16 INC#82;BNE NN17;INC#83
  160 :NN17 LDA#B001;AND@#40;BNE NN13;RT
S
  165 \ TRANSLATE & MOVE ROUTINE
  170 :NN0 LDY@0;STY#03;STY#04;STY#05;ST
Y#83;STY#85
  180 LDA@#2B;STA#86;LDA@#82;STA#06;LDY#
03
  190 :NN1 LDA(#05),Y;CMP@#02;BEQ NN3
  200 :NN2 INC#05;BNE NN1;INC#06;BNE NN1
  210 :NN3 INY;LDA(#05),Y;CMP@#0D;BNE NN
2;INC#05;BNE NN4;INC#06
  220 :NN4 LDY#03;LDA(#05),Y;CMP@#3B;BNE
 NN5;LDA@#20;BNE NN6
  230 :NN5 CMP@#3A;BNE NN6;LDA@#3B
  240 :NN6 LDY#83;STA(#85),Y;INC#03;INC#
83;CMP@#0D;BNE NN4
  250 LDY#03;LDA(#05),Y;CMP@#03;BNE NN7
  260 LDY#83;LDA@#FF;STA(#85),Y;RTS
  270 :NN7 LDX@0;LDY#03;JSR#C465;DEC#04;
LDY#83;LDA#25;STA(#85),Y
  280 INY;LDA#16;STA(#85),Y;INY;TYA
  290 CLC;ADC#85;STA#85;BCC NN8;INC#86
  300 :NN8 LDA#03;ADC#05;STA#05;BCC NN9;
INC#06
  310 :NN9 LDA@#00;STA#03;STA#83;JMP NN4
  320 :BB0 LDA@BB1%256;STA#214;LDA@BB1/2
56;STA#215;RTS
  330 :BB1 STX#EC;STY#C3;PHP;SEI
  340 :BB2 LDA@#7E;STA#C0
  350 :BB3 JSR#FCBD;BCC BB2;INC#C0;BPL B
B3
  360 :BB4 LDA@#14;STA#C4;LDX@0;LDY#B002
  370 :BB5 JSR#FCCD;BEQ BB6
  380 :BB6 BEQ BB7;INX
  390 :BB7 DEC#C4;BNE BB5;CPX@#03;ROR#C0
;BCC BB4
  400 LDA#C0;PLP;LDY#C3;LDX#EC;PHA;CLC;A
DC#DC;STA#DC;PLA
  410 STA#801E;RTS
  420 :BB8 LDA@#EE;STA#214;LDA@#FB;STA#2
15;RTS;]
  430 NEXT;PRINT$6$11$11
  440 PRINT"LINK #"&M"..........LOAD DAT
A"'
  450 PRINT"LINK #"&NN12"........CHECKLI
ST"'
  460 PRINT"CTRL......STOP LOAD/STOP CHE
CKLIST"'
  470 PRINT"LINK #"&NN0"......TRANSLATE
& MOVE"''
  480 PRINT"    *SAVE ""BASICODE"" "&M" "
&P
  490 PRINT''
```

Listing 1. This program enables the Atom to load BBC Radio 4's Basicode transmissions. Barry Pickles show you how to run them (below)

Translate and move

Lines 190 and 200 look for #02, Line 210 looks for #0D, looping until found.
Lines 220 and 230 check for #3B (;) and substitute a space, and for #3A (:) substitute #3B (;).
Lines 240 and 250 look for #0D followed by #03 and terminate if found.
Line 260 adds #FF to the end of the text.
Lines 270 and 280 use #C465 to change the line numbers in the data from ASCII to binary, recovering them from the workspace stack at #25 and #16.

1200 baud routine

Line 320 redirects the OSBGET vector, lines 330 to 410 use the standard Atom routine modified for 1200 baud, with a visible indication of loading.
Line 420 restores the vector to normal.

Procedures

Load this program and run to assemble the machine code. Note the addresses displayed as Link routines, *SAVE the m/code, and then press Break.

Do not execute OLD but LINK# as required to the Load routine, respond to the prompt and play the Basicode program as recorded.

Press the CTRL key during the five-second tone at the end of data. The machine code loop will exit when the tone finishes.

You may now LINK# to the Checklist routine to verify that the data is loaded and converted to ASCII characters. Checklist may be terminated by the CTRL key.

Then LINK# to the Translate and move routine to complete the operation. Note that an error code may be generated after this sequence. This should be ignored.

Also note that the Atom-Basicode listing has now been overwritten, hence the need to *SAVE the m/code portion as described earlier, and to note the routine addresses before commencing the operation.

COMPLETING THE CONVERSION, by Barry Pickles

G R SPRAY's program (listing 1) gives you the ability to load Basicode programs, but you still need to do some work before they'll run.

Basicode 2 uses a series of standard subroutines to overcome the problem of compatibility. These are written in machine-specific code to perform standard functions. Listing 2 gives the Atom version. It should be entered at #2900. Note that lines 98 and 998 consist of line numbers followed by a single space. This is because when entered, this program *must* produce a value for TOP of #2B02, so these dummy lines give you some margin to adjust TOP, by adding or deleting spaces.

Basicode 2 follows a certain syntax and some conversion will be required. First you must record the Basicode transmission (instructions for this are given just before the transmission starts). Now load listing 2, but do *not* run it. Then load the assembled code from G R Spray's program and run this by linking to the three routines. Once done, press Break, followed by Old and End. On listing you should see listing 2 with the Basicode program appended to it (from line 1000). Now you can undertake final conversion.

First, you'll see that Basicode variables are two characters long. Numeric variables are also real (ie. f.point) numbers, unless preceded by INT, and must be assigned a starting value. From line 1000 onwards, make separate lists of the numeric or string variables and assign an Atom-type variable to each – if you run out of vari-

ables, use arrays and DIMension them in line 10.

The following variables are reserved by Basicode for use in the standard subroutines. Their Atom equivalents are given in brackets and you must *not* use them for any other purpose in conversion:

- HO (H) – cursor column position
- VE (V) – cursor row position
- FR (F) – bytes free (Adjust line 270 if you have memory above #3C00)
- SR (%S) – numeric variable to convert to string
- RV (%R) – random number
- IN$ ($I) – single character input string
- SB$ ($S) – string created from %R

Two other variables, CT and CN, are reserved by Basicode – these may be removed in conversion. Variable P is kept for the Atom standard routines and may not be assigned by the user.

Strings are manipulated as in BBC Basic – see the Atom manual for the equivalent routines. READ and DATA should also be converted, either as suggested by the Atom manual or by the routine given in Atom Forum on page 135, January 1984. Other non-Atom keywords used will convert as shown in my previous articles on conversion to BBC Basic.

```
  1REM:part 1
  2REM:reserved variables
  3REM: F,H,V,I,%R,%S,S,P
  4REM
 10DIMS9;P=#21C;P.$21;[
 11JSR#FE71;TYA
 12ADC@#20;STA#80
 13RTS;JSR#FFE3
 14STA#80;RTS;];P.$6
 15I=#22C;?#22D=13
 16G.1000
 20DIMA;R.
 98
 99REM:standard subroutines
100P.$12;R.
110!#DE=#8000+(32*V)
111?#E0=H;R.
120V=(?#DF*256+?#DE)/32
121H=?#E0;R.
200LINK#21C;?I=?#80
201IF?I=45;?I=13
202R.
210LINK#225;?I=?#80;R.
250P.$7;R.
260%R=A.R.%1-1;R.
270F=#3C00-T.;P.F
271P."BYTES FREE"';R.
300STR%S,S;R.
310STR%S,S;R.
350P.$2$S$3;R.
360P.$2$S'$3;R.
998
999REM: main program
```

Listing 2. Atom Basicode standard subroutines – enter at #2900.

Very occasionally, you may find strange subroutines in lines 20000-24999. These are specific to the machine they were written on, but the Basicode protocol requires that their use is fully explained in REM statements – such subroutines are generally frowned upon and rarely used. Should you find yourself running out of memory, any line number higher than 29999 may be deleted without affecting the program, and (since only text is allowed) line 10 may be preceded with:

9 ?35 = 0; ?36 = #82

to reallocate DIM space.

Screen format is agreed to be 40 × 25, so you may need to play around with print statements to make it look neat.

Once the conversion is complete (it usually takes longer to describe than to do), run the program and, if all is well, save the lot (including lines 1-100) in the normal way.

Finally, please note that although Basicode implementation programs are public domain, the copyright on transmitted Basicode programs remains with the author, and they may not be reproduced without the permission of the author and the BBC.

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```
LINCOLN Microsystems V1.0 (c)1984
FILEAID
Record Description                Page 1
E.G (NEW)
Field name               Length
Item_No%                    4
Short_Name$                30
Price_Each                  5
Stock_Level%                4
Supplier_Name$             40
Supplier_Ref$              15
Supplier_Tel$              15

Enter file size =>  100
```

```
10REM Print out E.G File Records
20REM where the Stock_Level < 5
30REM
40REM Setup FILEAID System Variables
50 FRC%=0
60 FILE$="E.G"
70REM Setup E.G Record Variables
80 Item_No%=0
90 Short_Name$=STRING$(30," ")
100 Price_Each=0
110 Stock_Level%=0
120 Supplier_Name$=STRING$(40," ")
130 Supplier_Ref$=STRING$(15," ")
140 Supplier_Tel$=STRING$(15," ")
150REM FILEAID System initial call
160 *FINIT
170REM Position at top of E.G file
180 *FTOP
190REM Print out Qualifying Records
200 REPEAT
210 *FREADN
220 IF Stock_Level% > 4 THEN 250
230 PRINT Stock_Level%
240 PRINT Item_No%,Short_Name$
250 UNTIL FRC% <> 0
260 END
```

```
LINCOLN Microsystems V1.0 (c)1984
FILEAID
Audit Report
E.G
Maximum Records     100  Reorg Count        0
Current Records      78  Recommend
Available            22        Reorg       NO
Record Size         113
Total Fields          7  Drives    1
Key Field Name Item_No%          Len    4
      Access Statistics
Read Replace Insert Delete R-Delete
218    30      78      0       0
End of Report
```

```
LINCOLN Microsystems V1.0 (c)1984
FILEAID
Backup Report #  1
E.G
Entries              Entries            Status
Processed    78      Remaining     0    WRITE

SEQ:      75
KEY:     874

SEQ:      76
KEY:     908

SEQ:      77
KEY:     950

SEQ:      78
KEY:     953

End of Report
```

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FIGURING OUT SPREADSHEETS

Roger Carus calculates the pros and cons of three

ALTHOUGH spreadsheets are one of the best known uses of the microcomputer, fewer people have direct experience of using them than the more popular wordprocessors and databases. For those who regularly deal with figures, whether for family budgets or calculations at work, they have many uses and once you are familiar with them they become absorbing, because the figures develop a life of their own.

In theoretical terms a spreadsheet is a program providing a configuration of cells able to assume numerical values and to be inter-connected with mathematical and logical functions. This allows the construction of models whose components can be changed at will, that can be displayed or printed, and saved for later use.

The usual way to describe such programs is as they would appear on a large sheet of paper ruled into numerous columns along the top and rows down the side, to create cells or boxes which can contain either explanatory statements or number values, with each location defined like a map with a cross-reference grid (figure 1).

	A	B	C	D
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3
4	A4	B4	C4	D4

Figure 1. How a spreadsheet is made up in theory

In practice we do not see the A1, B2, etc but rather the entries that appear in those squares. The finished product is one of those large tables of figures and words which lie in wait for us in every walk of life, where things are set out logically and each column and row leads on to the next.

The distinctive feature of the computer version is the sheer size of the table which can be produced. In the largest grid produced by *ViewSheet* it's possible to create a table with 255 columns and 255 rows, making 65,025 boxes each containing seven characters, which I estimate would require a piece of paper about 12 ft wide and 4 ft long covered in closely typed entries. In fact the memory of the BBC micro would only allow one to fill a small proportion of the boxes.

The first and best known spreadsheet was *Visicalc*. This was designed for mainframe computers to undertake financial planning but worked equally well with any kind of numerical manipulation, and provided the basis for all programs of that type today. As a concept if was just as applicable to microcomputers, and was one of the foundations of the Apple range's success.

```
ENTER     # for commands and    " for text
DIRECTLY    for     data and      formulae
 ■■■■■01■■■■■■■■02■■■■■■■■03■■■■■■■■04■■■■
A■                    OAT BISCUITS LTD.
B■
C■                         Jan.      Feb.
D■
E■SALES                   42000     42840
F■COST of sales           28560     29131
G■-----------------------------------------
H■GROSS PROFIT            13440     13709
I■less
J■           Wages         7800      7800
K■           Rent          2050      2050
L■           Other         1500      1800
M■
N■TOTAL EXPENSES          11350     11650
O■-----------------------------------------
 ■---------

?■
```

Vu-Calc is cheap, will let you get the hang of spreadsheets and keep a first rate household budget on record

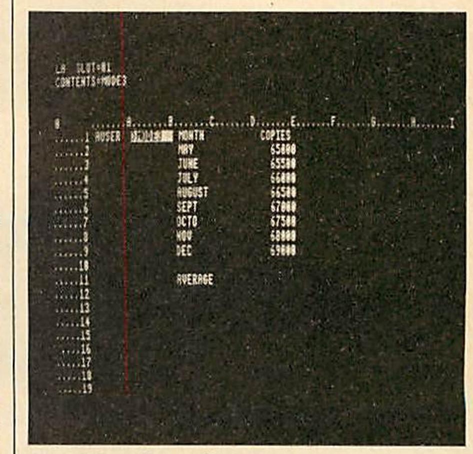
In turn these adaptations have inspired similar programs for the BBC micro. They allow the user to create a self-selected program to produce tables of data without the need to undertake any programming, and provide a framework program into which you can insert your own set of calculations. The benefit lies in the ability to recalculate long and complex tabulated data in very short times.

It's impossible to give more than a few suggestions about the uses for spreadsheets, but anyone who deals with home or business accounts and forecasts, statistics, engineering and scientific processes, or produces tables with series of routine calculations, is likely to have a use for such a program.

First, the nature of entries into the cells needs to be considered and there are three possibilities (the examples refer to figures 2 and 3). You can enter labels which describe the contents, including all the words such as 'shares held', or you can enter values which may take the form of a number which is fixed (unless you change it), such as the '100' shares in Lloyds Bank or a relative number, as in the case of the hidden formula 'D3*D4', which produces the value of the shareholding which appears as '499', while if the price rose to 5.22 the value would automatically be adjusted to '522'.

This very simple example illustrates the kind of thing a spreadsheet can do quickly and accurately, but it is of much greater use on a longer table needing to be recalculated frequently which would be tedious if done with pen, paper and calculator.

Details of the spreadsheets considered are summarised in the 'What they offer' table on page 141. As you would expect the cassette system, *Vu-Calc*, is much the cheapest, and it transfers to disc very easily. Being the shortest program it is the least sophisticated and lacks many of the features of the others. I found the manual much too brief – the one supplied with *ViewSheet* is a model of its kind, and is a good tutorial guide for the beginner.



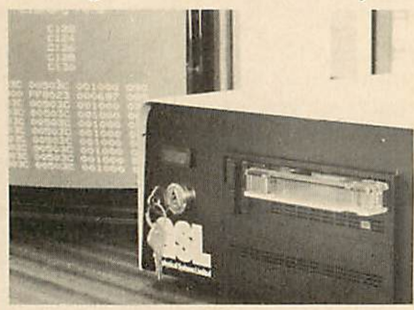
ViewSheet in mode 3

In any spreadsheet program you have to be able to view your work on the screen, and obviously you cannot hope to see the whole of a large sheet but only a 'window' on part of the work. The size of this window varies and is largest if the program is capable of running in



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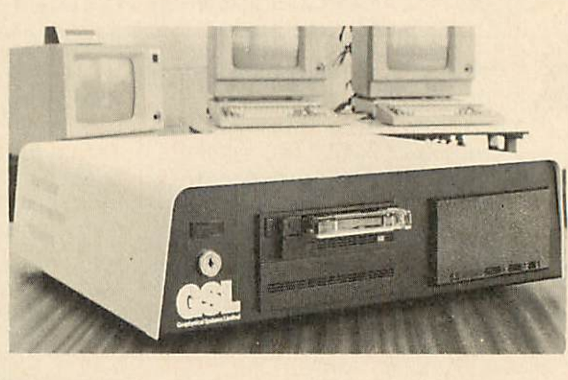
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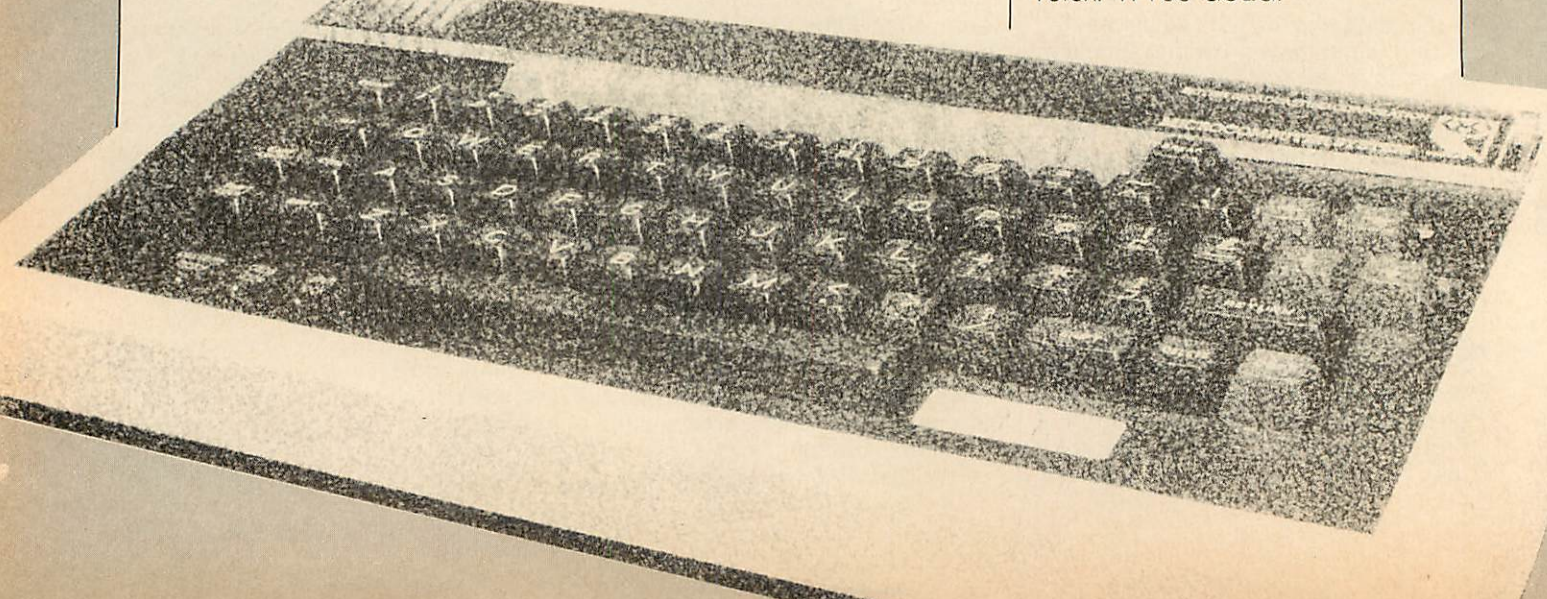
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mode 3, which is suitable provided you are using a high resolution monitor, but it does of course take up more space in memory. If you are restricted to viewing in mode 7, as is the case with *Vu-Calc*, then you see less of what is going on and are more often obliged to manoeuvre around the display. It is also necessary to consider the size of the spreadsheet at your disposal and the space provided in each cell (although the latter can be changed in the longer programs).

With the two ROM systems it's possible to vary the mode and also the slot size. This is important if you are trying to construct a large model since a greater number of cells visible in the window make working much easier. The new edition of *Ultracalc* (called *Ultracalc 2*) represents a major improvement and those who have the earlier edition should certainly accept the offer from BBCSoft to exchange it for the newer version at a cost of £6.25. An important feature of *ViewSheet* is that it allows the user to produce an alternative screen on which up to 10 windows can be seen at one time, permitting sight of several key areas of the matrix. However it's worth stressing that the cheaper *Vu-Calc* is perfectly satisfactory for smaller tasks and less frequent use, provided you are willing to exercise a little patience.

The next most important feature of any spreadsheet program is its ability to carry out arithmetical functions and make the full use of the Beeb's abilities as a calculator. All the programs can add, subtract, multiply, divide, use brackets, raise to the power of n and find square roots, as well as the other functions provided for in Basic. In practical terms these are the abilities most likely to be used and are available in all three programs.

However the two ROM-based systems add substantially to this list with a range of trigonometrical and statistical functions and conditional statements which put them in a different class entirely. It's difficult to make an accurate comparison without reproducing a list of 40 or so functions and commenting on each, but my assessment is that *Ultracalc 2* is stronger on the mathematical side and so likely to be of more use to those concerned with engineering or science applications, while *ViewSheet* has the edge where statistical capabilities count most and so is more convenient for accounting and business forecasting.

COMPANY	SHARES HELD	COST OF HOLDING	CURRENT PRICE	HOLDING VALUE	PROFIT /LOSS
LLOYDS BANK	100	400	4.99	499	99
RENTOKIL	250	250	1.34	335	85
HEPWORTH	125	300	3.04	380	80
PLESSEY	200	400	2.26	452	52
TESCO	100	100	1.92	192	92
		1450		1858	408

Figure 2. A spreadsheet produced on Vu-Calc

COMPANY	SHARES HELD	COST OF HOLDING	CURRENT PRICE	HOLDING VALUE	PROFIT or LOSS
LLOYDS BANK	100	400	5.02	502	102
RENTOKIL	250	250	1.33	333	83
HEPWORTH	125	300	3.22	403	103
PLESSEY	200	400	2.22	444	44
TESCO	100	100	2.07	207	107
	TOTAL	1450		1888	438
PERCENTAGE	OR LOSS				30.21

Figure 3. How Ultracalc 2 handles similar information

The method of data entry is substantially the same in each case, with a small command panel at the top of the screen and each entry directly addressable to the cells in the grid. The power of the spreadsheet is the ease with which the operator can move around the sheet and, more importantly, make groups of entry through the powers of replication. The former ability is much the same in each case and easily mastered. The problems arise from replication – expressed very simply, this is the ability to apply an identical process to a series of entries without the need to key in each separately.

As a simple example, in figures 2 and 3 it's necessary to multiply the number of shares held by the current price to obtain the current value, and then take away the cost price to find the profit or loss. For a long portfolio valuation that might take hundreds of entries; it's much easier to be able to put a single formula in each of two squares and then duplicate them throughout the appropriate columns. The process is simple in theory but it takes some time to become familiar with the method used by each program, and that's when the quality of the manual becomes critical. I almost went insane trying to compare methods by switching between the systems. The *Vu-Calc* manual is the most limited and rather odd at times, while the clarity of that of *ViewSheet* gives it the advantage in this respect.

All the programs can save data on disc or cassette and restore it at will. *Ultracalc 2* and *ViewSheet* can also save sections of a sheet; very useful in producing a series of projections at dif-

ESTIMATE OF WORDS IN FORMATTED TEXT

LINES per PAGE	CHARACTERS per LINE: 40	45	50	55	60	65	70	75	80
	WORDS								
30	196	221	245	270	295	319	344	368	393
35	229	258	286	315	344	372	401	430	458
40	262	295	327	360	393	426	458	491	524
45	295	331	368	405	442	479	516	552	589
50	327	368	409	450	491	532	573	614	655
55	360	405	450	495	540	585	630	675	720
60	393	442	491	540	589	638	687	736	786

Figure 4. A more complex model produced on Ultracalc 2


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ferent stages of a process, for example. The ability to protect parts of the sheet from accidental corruption is helpful and can be found on both the ROMs.

The last major area of capabilities is that of sending whole or parts of sheets to a printer, and if possible linking with a wordprocessor to produce reports. All the programs can work with any printer capable of being driven by the BBC micro, but *Vu-Calc* can only offer a straight printout of sections of the sheet. *Ultracalc 2* allows a more sophisticated approach, but there is no doubt that *ViewSheet*, with its ability to create multiple windows and print them, is by far the most advanced of the three, and it can work with the *View* wordprocessor giving it great advantages, although a printer driver is required to get the best out of them both.

I tested the three programs by setting up the same models on each. The first was a simple portfolio record of the level that one might start on soon after purchase.

The second was longer, with numerous tedious calculations to estimate the number of words on a sheet of A4 paper (figure 4).

The third was a long model (16 columns by 81 rows) designed to distribute the budget provision in relation to weighted student hours and then into numerous sub-headings which I use at work. It was originally designed on the now obsolete *Beebcalc* from Computer Concepts, which is shortly to be upgraded. It's too long to reproduce here but saves me at least two working days each year!

The three programs are not strictly comparable as one is a cheap and simple cassette-based system, and the others much more sophisticated ROM spreadsheets with similar powers to *Visicalc* but rather different in minor characteristics. Some of the comments already made will help you to make the choice, but in the end it's likely that your needs will point to one or other. In the 'How they score' table I assess their performance of certain tasks.

If you want a spreadsheet program in your library for occasional use then *Vu-Calc* is cheap, cheerful and adequate for your needs. It will let you get the idea of a spreadsheet, try your hand at model building and keep a first rate household budget on record which is at least as good as many of the special commercial programs for that purpose. The list of features it lacks is long, but it's good value and probably the right choice for anyone without disc drives. It's greatest drawback is its manual which is difficult to learn from without some prior knowledge.

Most serious prospective users will

WHAT THEY OFFER

	Ultracalc 2	ViewSheet	Vu-Calc
Publisher	BBCSoft	Acornsoft	Psion Software
Recommended price	£79.50	£59.80	£14.95
System type	16k EPROM	16k EPROM	9k cassette, transfers to disc
Manual	80-page A5 ring binder plus 16-page supplement	138-page A5 ring binder, plus reference card and function key card	14-page stapled booklet
Columns	63	255	28
Rows (or lines)	255	255	52
Matrix size (cells)	16065	65025	1456
Cell size (default)	7 characters	7 characters	9 characters
Window size (maximum in default)	9 columns × 20 rows = 180 cells	9 columns × 19 rows = 171 cells	4 columns × 15 rows = 60 cells
Command	*CALC	*SHEET	*RUN VUCALC (NB No hyphen)
Micro	BBC B with 1.0 OS or later. Works with 6502 second processor	BBC B with 1.2 OS or later. Works with 6502 second processor	BBC A and B

HOW THEY SCORE

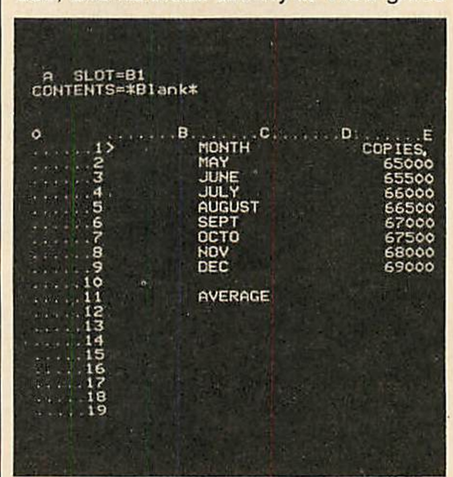
	Ultracalc 2	ViewSheet	Vu-Calc
Size of matrix	7	9	4
Labelling	8	5	9
Making entries	7	9	4
Replication	7	9	5
Commercial uses	7	9	4
Scientific uses	8	7	3
Statistical uses	6	8	3
Display	6	9	2
Graphics	0	7	0
Printing	6	8	4
Wordprocessing linkages	5	8	0
Speed	6	7	4
Ease of use	7	5	5
Documentation	6	9	2
Overall value	6	8	4
Comments *Marks are out of ten*	Good package for most uses but rather costly	Best all round commercial and statistical program, with good display and graphics	Cheap but very limited sheet with serious drawbacks

choose between the two more expensive ROM systems and the points made above on general features should be carefully considered. There's not a great deal to choose between them on balance, but I'll attempt to identify the good and bad features of each. As a generalisation, *Ultracalc 2* is easier to use but more difficult to learn (mainly because of the manual), while *ViewSheet* is the opposite.

Ultracalc 2 is much better than its predecessor and has many good points – each column can have its width altered easily and independently; block copying is simple, as is protection and formatting of entries; lookup tables which assist in combining complex information from various sources can easily be given labels; it has a facility for net present values, which is of greatest use in commercial calculations of discounted value; its summation facility is very convenient; and columns can be brought together easily to avoid spaces in labels.

Among its defects is the limitation on transfer to a wordprocessor, which is not impossible but far from convenient. I miss the wildcards which made the old *Beebcalc* handy for two dimensional replication; it has no graphics facilities; and the manual has no index, which is absurd.

ViewSheet feels quite different in use, and its close affinity to *View* gives it several advantages for those familiar with that wordprocessor. It also has good statistical abilities with ready-made averages, medians and location of minimum and maximum; its multiple window display is first-class and of professional quality; the use of colours is easier and more helpful; and, for me at least, the ability to replicate in two dimensions, which saves much time with tabulated data such as that in figure 4, is a substitute for the absence of wildcards.



Example of a spreadsheet on ViewSheet in mode 7

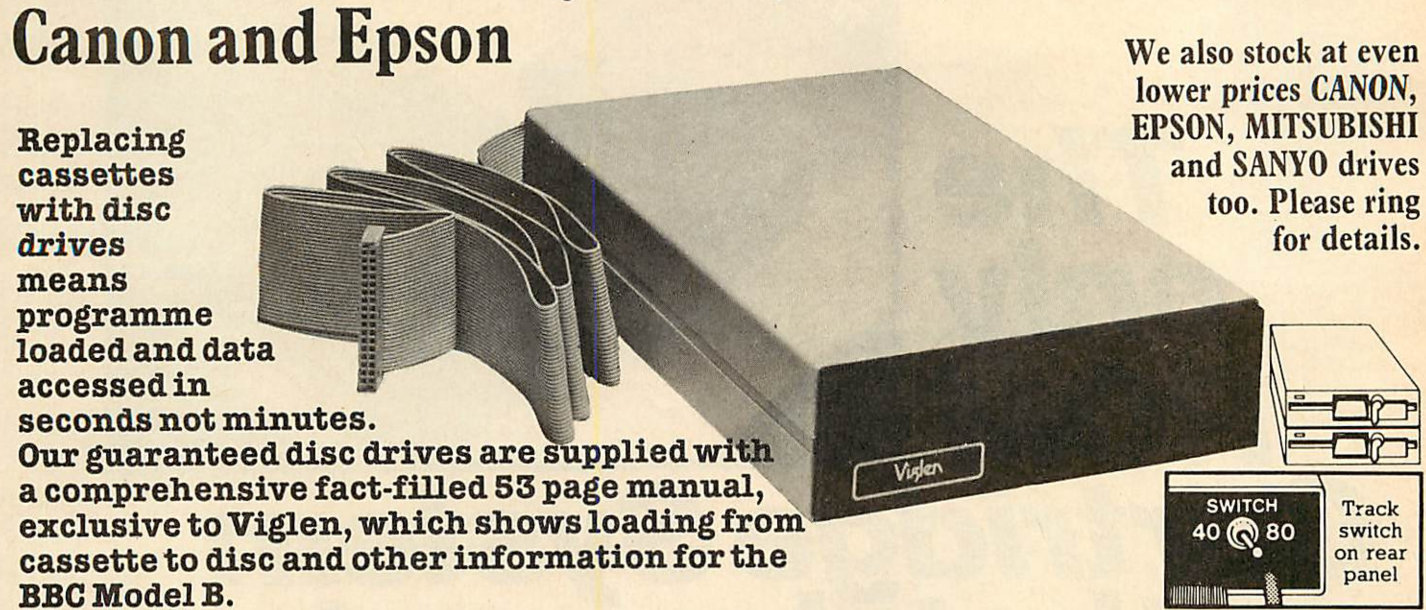
On the other hand, *ViewSheet* is not without drawbacks, and many of these are connected with the labelling of cells, such as the problem of creating a table where a number is a label (eg dates), which it tries to treat as a value, and the gaps it insists on putting in between columns.

It seems rather churlish of me to complain about the difficulty in creating the multiple windows as they are such a good feature of the program, but it reflects a general complexity of use which meant that I had to work with the manual constantly open in front of me. At least the manual has a good index, an excellent function key card and reference card.

All three spreadsheets have their uses and the two ROMs will be hard to beat: extra memory is the only other thing you need to have a valuable commercial or scientific tool at your disposal – and with a second processor you've got it.

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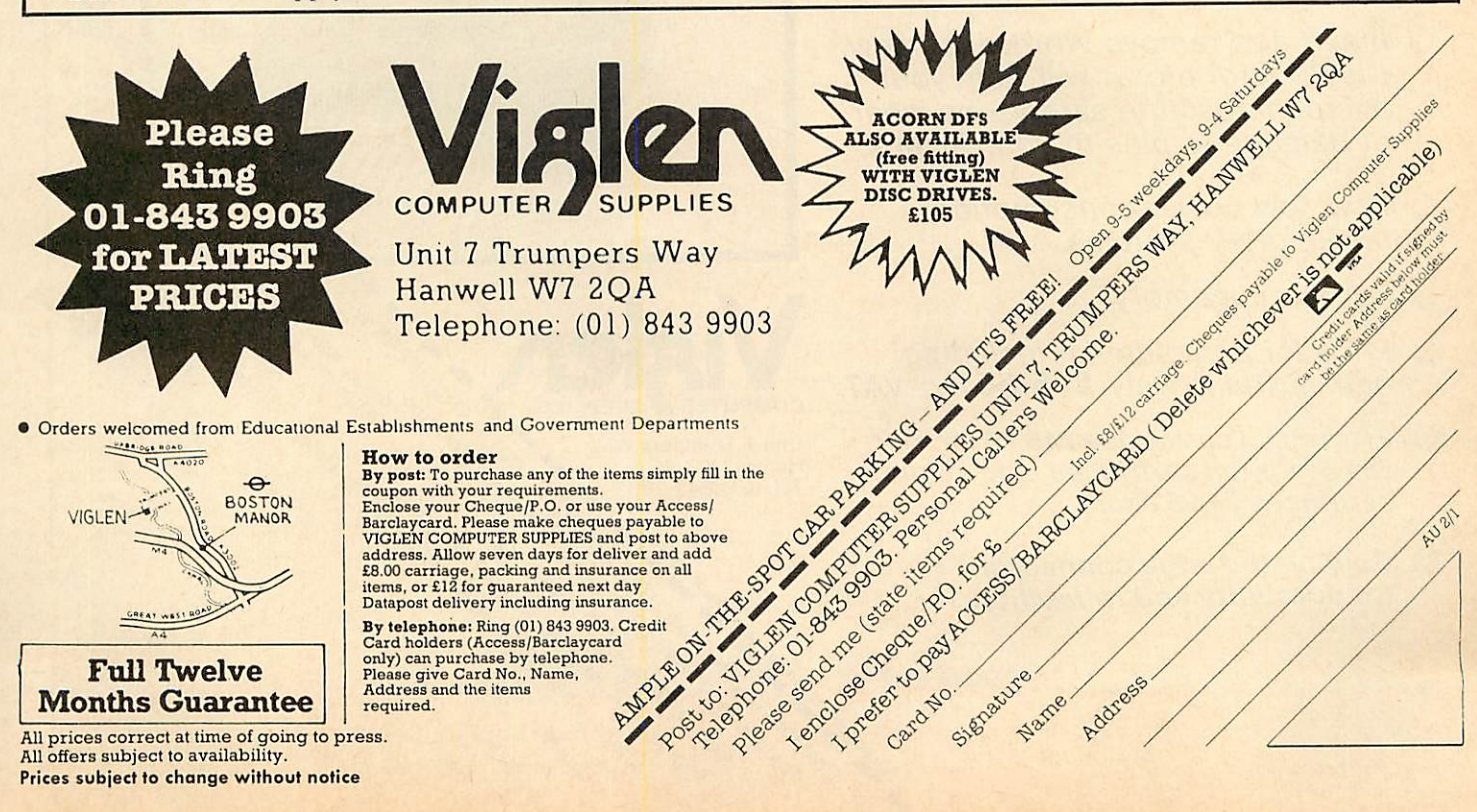
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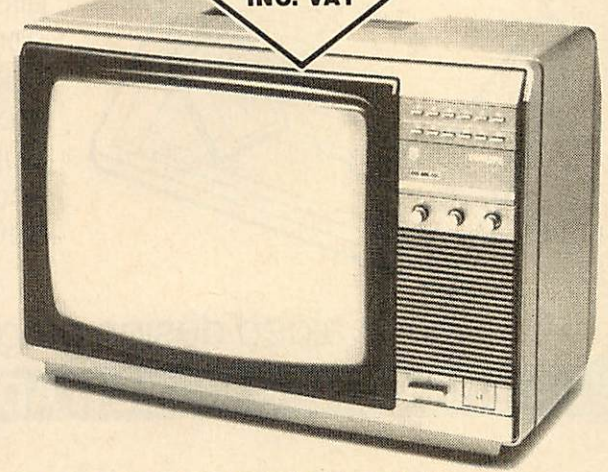
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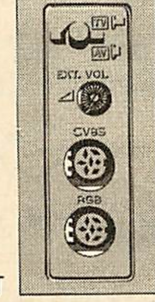
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INDEX
AUGUST 1983 TO JULY 1984

THESE cumulative indexes cover *Acorn User* numbers *13* to *24* (August 1983 to July 1984). You'll find indexes for our first 12 issues in the December 1983 *Acorn User*.

There are separate indexes for articles without programs, articles with program listings and authors of articles. Next month we'll give you indexes for authors of reviews, book reviews, hardware/firmware reviews, and software reviews.

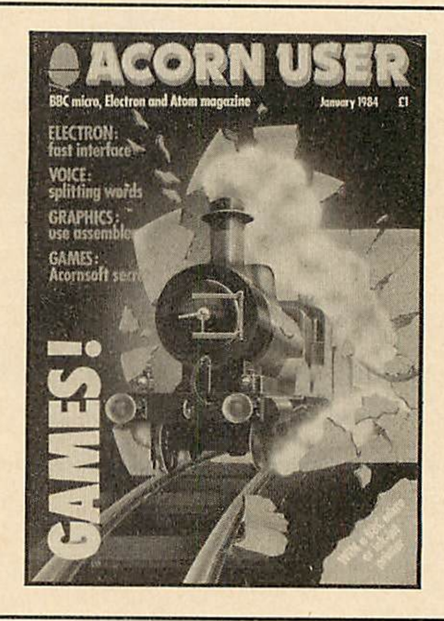
Each index entry refers to the *issue number (in italics)*, then the page number at which the item begins.

Compiled by Paul Nash.

ARTICLES WITHOUT PROGRAMS

ARTICLES WITH PROGRAM LISTINGS

AUTHORS OF ARTICLES/PROGRAMS/TIPS

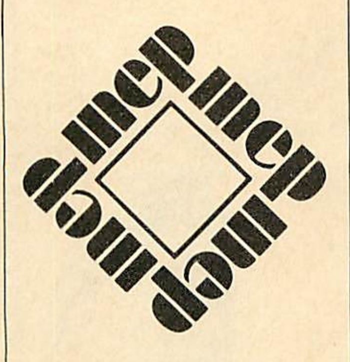


Fate of MEP in the balance

THE final fate of the Microelectronics in Education Programme is soon to be decided. Its planned cut-off point is March 31 1986 and many people, not least those employed by MEP, are anxious about its future.

If that really is its end, there will be a surplus of experts flooding the market, drifting back into the schools they were seconded from and looking for posts with software publishers and research groups. Not only would there be superfluous talent around, but also a total lack of guidance for teachers, other than from the established advisory teams.

If this isn't the case, as seems likely, let me speculate on what could happen. Will MEP be extended for a further period? Will the regional structure disappear and a national body take over? Will it be run by software publishers or will the MEP employees set up

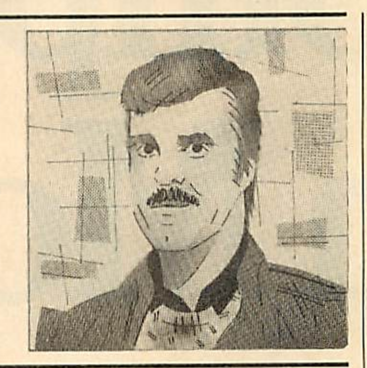


workers co-operatives to run non-profit-making advisory centres for the rest of us?

It's evident that something is needed unless the LEAs really want to halt the progress of micros in education. The ministers who have been meeting for the past month or so will undoubtedly be lobbied by many groups and come under pressure from the publishers. Nothing definite is likely to emerge until the end of February when proposals from the various groups, led by Richard Fothergill and his executive, interested Directors of Education and Senior Education Officers, will have been assessed and a new initiative planned.

Whatever happens – we'll keep you posted.

Commentary by Nick Evans, who welcomes reader feedback



College develops its own viewdata system

SCHOOLFAX is a local viewdata system designed at New College, Swindon with the recommendations of the Council for Educational Technology report 'Prestel and Education', kept in mind.

Its pages are similar in appearance to those of Teletext, with a running date/time display at the top of the screen. For general school use the system is limited to the systems disc and file records, so its capacity is as large as the disc storage available.

At New College, however, the system is running on E-NET with a 4,000 page data file. The facility to remove sub-files from the main system and run them independently is also used in the refectory, where a stand-alone machine provides a College News system.

Pages from other viewdata systems may be grabbed and added to the main file. Page creation is easier than that of some other Teletext/Prestel emulators, because of its more advanced editing techniques which allow greater movement of text on the screen.

This sophistication needs an increased level of skill in operating the system. Whereas *Edfax*, for example, has very simple editing techniques which are eminently suitable for children, this package is more geared to advanced use – the facilities available and the means of implementation also reflect this.

It is priced at £35 per copy, whether for use on BBC or on E-NET. Further information and orders should be addressed to Schoolfax, New College, Helston Road, Swindon, Wilts.

Or, of course, you could set up the teletext emulator, developed by Joe Telford on pages 77-85 of the January '85 *Acorn User*. Details of a software package, available only to LEAs on a licence basis, can be obtained from Cleveland Educational Computing Centre, Prissick Base, Marton Road, Middlesbrough, Cleveland.

High-tech design package

NEW from Ibbotson Design Software, is *DDX*, a two-dimensional design package which, by using program overlay techniques, increases the facilities available to the user to execute highly intricate drawings. It accepts input from Grafpad and will produce hard copy on both a dot-matrix printer and a plotter.

Other software from the company includes *Digital Drawings* (the precursor of *DDX*) and *3D View* which enables the user to draw in perspective and try out different aspects by moving the viewpoint while retaining the original picture in the Beeb's memory.

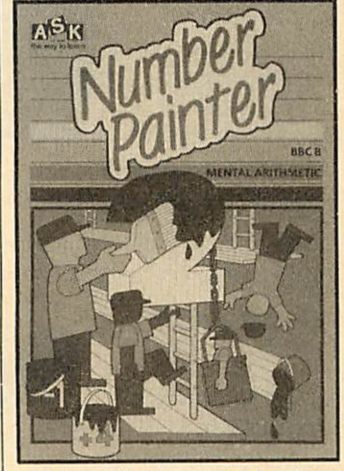
Quality isn't cheap, of course, and *DDX* on disc costs £99.95. *Digital Drawings* is available at a reduced price of £49.95 since the arrival of *DDX* and *3D View* costs £24.95 (prices are exclusive of VAT and carriage).

Details from Ibbotson Design Software, The Byre, Ecclesbourne Lane, Idridgehay, Derbyshire DE4 4JB. Tel: 077 389 658.

ASK expands overseas

APPLIED Systems Knowledge (ASK) has concluded agreements with companies such as Acornsoft, Commodore, Sinclair and Dragon to market their products, which are already being sold as far afield as Australia and the USA.

The company, which is steadily earning itself a reputation for quality software, intelligent ideas and good theoretical groundwork, was founded in 1981 by Professor Tom Stonier of Bradford University, who is firmly of the



opinion that as technology develops, so learning will become increasingly home-based using the micro.

The company believes children should enjoy what they are doing and should be encouraged and guided but not drilled or taught with constant repetition. The programs are patient, contain a variety of stimulation and are not violent, sexist or racist.

Information is available from ASK, London House, 68 Upper Richmond Road, London SW15 2RP.

Can you help?

HELP with a research programme has been requested by a reader who would like teachers who have used or are using micros in English teaching to fill in a questionnaire. All levels of schooling including special education are required. Please contact: Ms V M Johnston, Centre for Educational Technology, University College, 8 North Road, Cardiff CF1 3DY. Tel: 44211.

Central file exchange plan in limbo

HAS it ever occurred to you that a central system of file exchange would be a good idea to minimise the massive duplication of effort that undoubtedly occurs in schools and LEAs?

Some regional micro centres and local viewing centres already offer this facility but tariff barriers seem to appear when it comes to crossing county boundaries.

Although a national strategy for program diffusion is under way through the Microelectronics in Education Programme and bodies such as the Council for Educational Technology, the poor old data file seems to be in limbo. Programs that depend on them, as *Microtext*, often demand a great deal of time and effort in their creation. Yet a good *Microtext* file is useful, not only to its creator, but also to other people working in the same field. Well, MEP – or anybody – what do you say?

Domesday disc coincidence



WAS it coincidence that the item in the *Times* a couple of months ago heralding the BBC's electronic Domesday Book, was on the same page as a column warning of the unreliability of video machines? Philips, who are designing a video-disc player especially for the project, came bottom of the reliability stakes! Perhaps the thought of all those schools involved (it should be all of us!) will prompt Philips to produce something of a better standard.



AS more children in schools begin to use the *Times Network*, so more inter-school projects are likely to take off. The information database and the electronic mail facilities mean that children are able to find their way round a system particularly designed for their needs. Schools already using Prestel are now undoubtedly pleased to be catered for individually. Teachers are also expected to use the system for exchange of information and ideas. If you've got a good project why not tell the rest of us?

Making the micro thief-proof

SECURITY of micros in schools is a continual problem for most teachers. If the thing is to be left unattended then it is easy prey for the thieves who blithely walk through schools every week, picking up equipment and personal property as they go. Solutions range from the drastic to the ridiculous.

Identification ROMs which will only respond to a given code seemed quite a good idea until someone pointed out that the theif could take it out! There have been further developments but the fact remains that the thief still has at least £400 worth of equipment, operative or not. The idea should be to stop him taking it in the first place.

Indelible identification paint – on the wrong surfaces this mixture is not indelible – it can be chipped off.

Nailing the micro to a bench or a trolley! Well this seems to have been the most successful method so far, with massive iron clamps arcing over the Beeb's frame and gripping it in fond embrace. The added padlock, and preferably ball and chain as well, give the micro the attraction of Spandau prison and the portability of the Tower of London – which is the idea I suppose!

Locking it away in the cupboard. Here the Beeb is an extremely efficient dust collector and is totally secure except from the most determined burglar.

I dodn't mean to trivialise because security is vital. Most LEAs don't insure items under about £1000 because it's not worth the premiums. They reckon it's cheaper to pay for replacement – which is fine unless the micro was bought for the school by the PTA or by school functions. Anything visible in a school is stealable and most heads are very tetchy about equipment left on public view.

Possible solutions? Well, ensure that all such equipment is used in bays which are invisible from outside the school and the corridors. Keeping equipment on upper floors helps, but reduces availability if it is to be moved around the school. Arrange the equipment conveniently on a purpose-built trolley which can be trundled into a cupboard at the end of the day; micro, monitor, printer *et al.* Register the ID numbers of all equipment and keep them in a separate place so that in case of theft you can identify it for the police. Encourage pupils and colleagues to take equipment home for the holiday or weekend so that it's out of harms way – or is it? Whose responsibility is it then? Well . . .

How wp boosts achievement

HOW wordprocessing can cure the under-achiever's fear of failure was the subject of a letter from Mr G S Hall of Bromley, Kent, who wrote: 'Standing by the keyboard, Danny is a changed boy. Gone are those fears, for a new and enlightened world has been opened up, a world of electronics and moving words.'

Both children and parents are delighted with the newfound abilities offered by wordprocessing. Packages for remedial use with children are now becoming available – *Beeline* for example (reviewed January '84) – and it would be interesting to know of other people's successes and failures with this sort of work.

Safe accessories from Klick

A WIDE range of trollies, shelving, trays and accessories for micro users in education is available from Klick Superframe, custom-designed to suit the most commonly used micros and peripherals. Notable features are the safety rails to keep the machinery on the trolleys, wheel-locks to stop accidental movement and a variety of trays which may be fastened on the outside of the trolley to hold plugs, printout paper or cassettes.

Klick also market a Microlock to secure a BBC micro to any wooden worksurface while still permitting it to be removed by those who have the key!

Further details from Klick Superframe, Unit 2B, Stag Industrial Estate, Atlantic St, Altrincham, Cheshire WA14 5DD. Tel: 061-928 5388.

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8 GREAT FEATURES

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It is a FILE which contains RECORDS. Records consist of a number of FIELDS containing the information—an analogy can be drawn with a card index in which a box of cards is the file. Each card is a record and each line on the card is a field.

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4) Field Size—up to 254 characters with complete line scanning
5) Access any record using Primary Key in 2 seconds
6) Holds—1200 NAMES AND ADDRESS records on 100K disk
7) Search—500 records on 5 fields in 60 seconds
8) Sort—500 records on 3 fields in 60 seconds

SYSTEM FEATURES

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- POWERFUL PRINTOUT OPTION—Eliminates need for separate mailing program, Parallel/Serial Printout allows setting of printer control codes, line spacing, tabulation, Headings etc, plus label printing with horizontal and vertical tab control.
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NEW ✱

✱ GLOBALENTRY enables repetitive data to be typed in once and placed in as many records as required. Can also be used with a search list to provide a powerful global edit/update facility that will save hours of typing.
✱ SPOOLER enables you to create spooled files that are compatible with Wordwise, View and other word processors. You can therefore present your data within a document or in varying formats etc. The spooler program will allow to format your spooled file in the same way as the print out option. You can therefore have headings, columns, titles, numbers etc.
✱ INPUT is a routine included on the disc which will allow you to write utilities for accessing your data and tailored specifically to your needs.
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The original REPLICA set a very high standard so the specification we set our chief programmer included some impossible features. In fact ACORN state that some of the things that we have done are impossible, it just took us longer that's all. REPLICA II transfers most cassette based programs to disk, even more than REPLICA. When you buy disk drives you do not have to throw away expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &EOO, those with up to 6 sections and those up to &6E in length eg adventure programs. No waiting for 6 minutes whilst adventure programs load.

REPLICA II is very easy to use. The user enters a name, how many sections and whether CHAIN,*RUN or *LOAD to load the first section. Press play and let the program do the rest, even a menu.
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DISCDEX will catalogue all your discs and store them in alphabetic order. In addition to the very useful search and load facility DISCDEX will also print out a full catalogue in alphabetic or disc order. Even more useful is the ability to print disc labels for sticking on the disc or the jacket.
DISCDEX is only suitable for discs with 31 file names as in the standard ACORN system. It is not suitable for double density interfaces.

NEW ONESHOT: £12.00 DISC

- Full feature trace utility.
- Single step through BASIC program or halt at user determined interval.
- Print line number prior to execution.
- Obey fixed instructions before executing a line.
- Trace window allows screen to be seen whilst tracing *execution*.
- "Printer only" will force trace output to a printer allowing full screen display.
- Ability to dynamically alter control of ONESHOT.
- ONESHOT can be configured to run in any area of memory.

ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.
A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. *KEY0 PRINT X%¦ M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity.
In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value.
ONESHOT is not compatible with double density interfaces.

NEW FUN HOUSE: £10.00 DISC

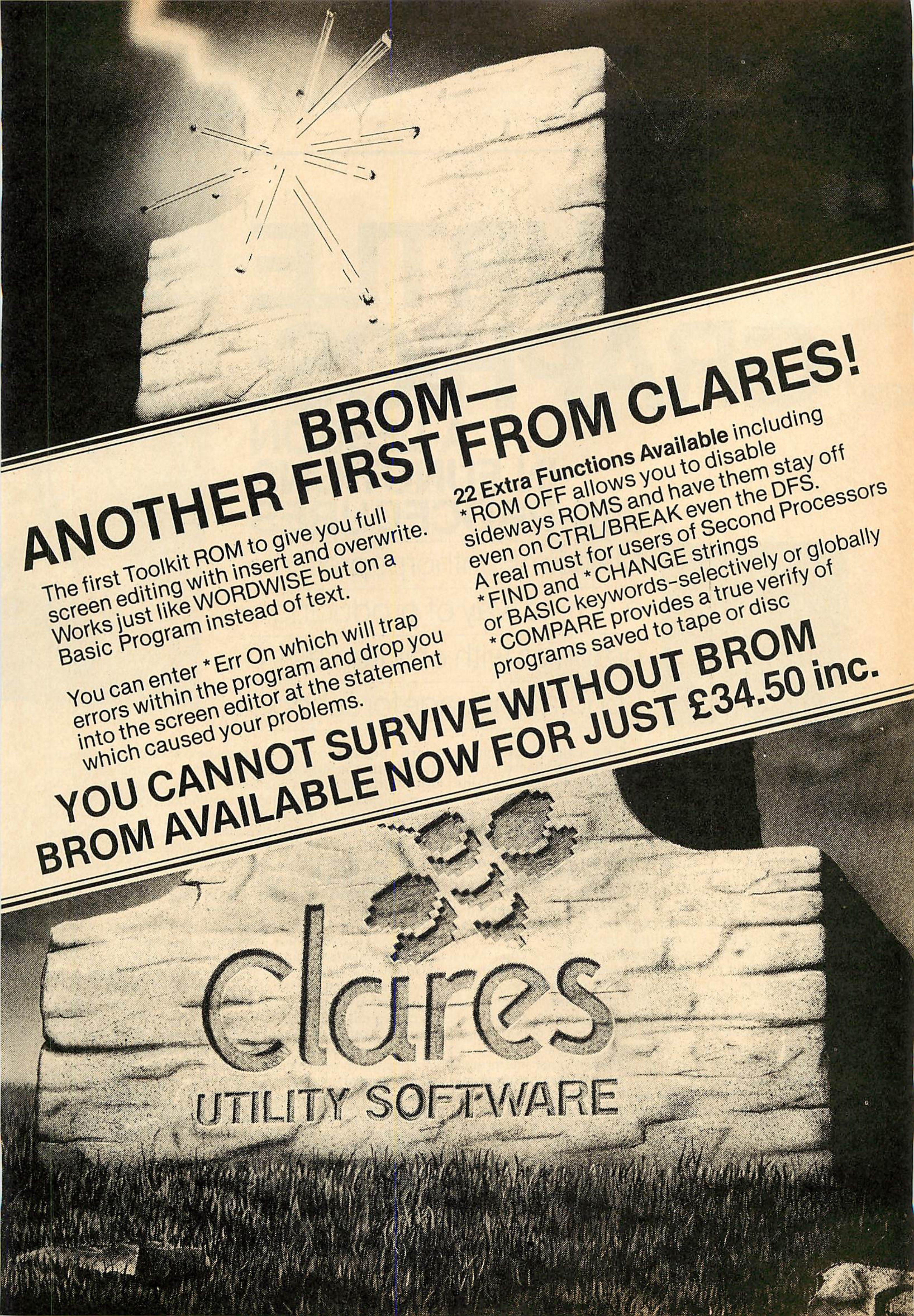
FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated.
Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?
FUN HOUSE is not compatible with double density interfaces.



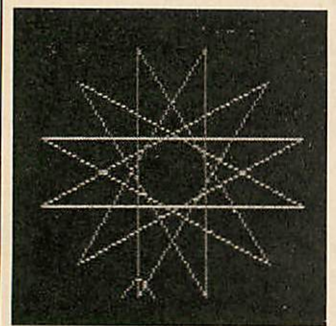
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TURTLE GRAPHICS: A LESSON IN FUNCTIONS AND PROCEDURES



Malcolm Banthorpe presents a simple way of producing graphics with children as in Logo, a language for schools

TURTLE graphics is a part of the Logo programming language which is seen by many as a superb way of introducing children to the theory of programming. In the process of presenting a turtle graphics interpreter, this article demonstrates user-defined functions and procedures.

The programming and syntax used by the interpreter is similar to that used by the computer language Logo, and as well as obeying turtle graphics commands entered directly from the keyboard, it allows shapes to be defined and subsequently recalled by name. Any shapes thus defined can be stored on disc or tape and used within further definitions. This effectively allows short pattern and shape generating programs to be written in a very simple language.

While in no way rivalling the power of a proper Logo interpreter, it is simple enough to be used by someone with no other knowledge of programming and versatile enough to generate a wide variety of geometric patterns. In addition to having the standard turtle commands, it can vary the types of lines drawn, allowing a greater variety in the patterns. It is suitable for use on either a BBC B or Electron.

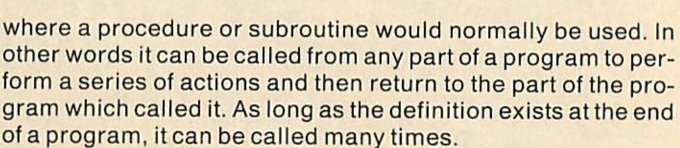
Since it can also be used as the basis of other interpreted mini-languages, the program may be of interest to programmers who wish to embark on a similar project.

As defined functions are employed in the program in a somewhat unconventional way, at least as far as Basic is concerned, the first part of this article will explain how they are used.

BBC Basic, unlike many other versions of the language, allows multiple line function definitions with more than one parameter. In addition, the use of local variables allows recursively-defined functions to be used. This makes them a valuable programming tool whose power extends beyond their common method of use.

A function can theoretically be used in almost any situation where a procedure or subroutine would normally be used. In other words it can be called from any part of a program to perform a series of actions and then return to the part of the program which called it. As long as the definition exists at the end of a program, it can be called many times.

Like a procedure and unlike a subroutine, parameters can be passed to it in the form of local variables. Also, as with a procedure, recursion can be used, ie the function definition may call itself, provided a condition is set which will terminate the function at some stage – otherwise it will carry on until the computer runs out of stack space.

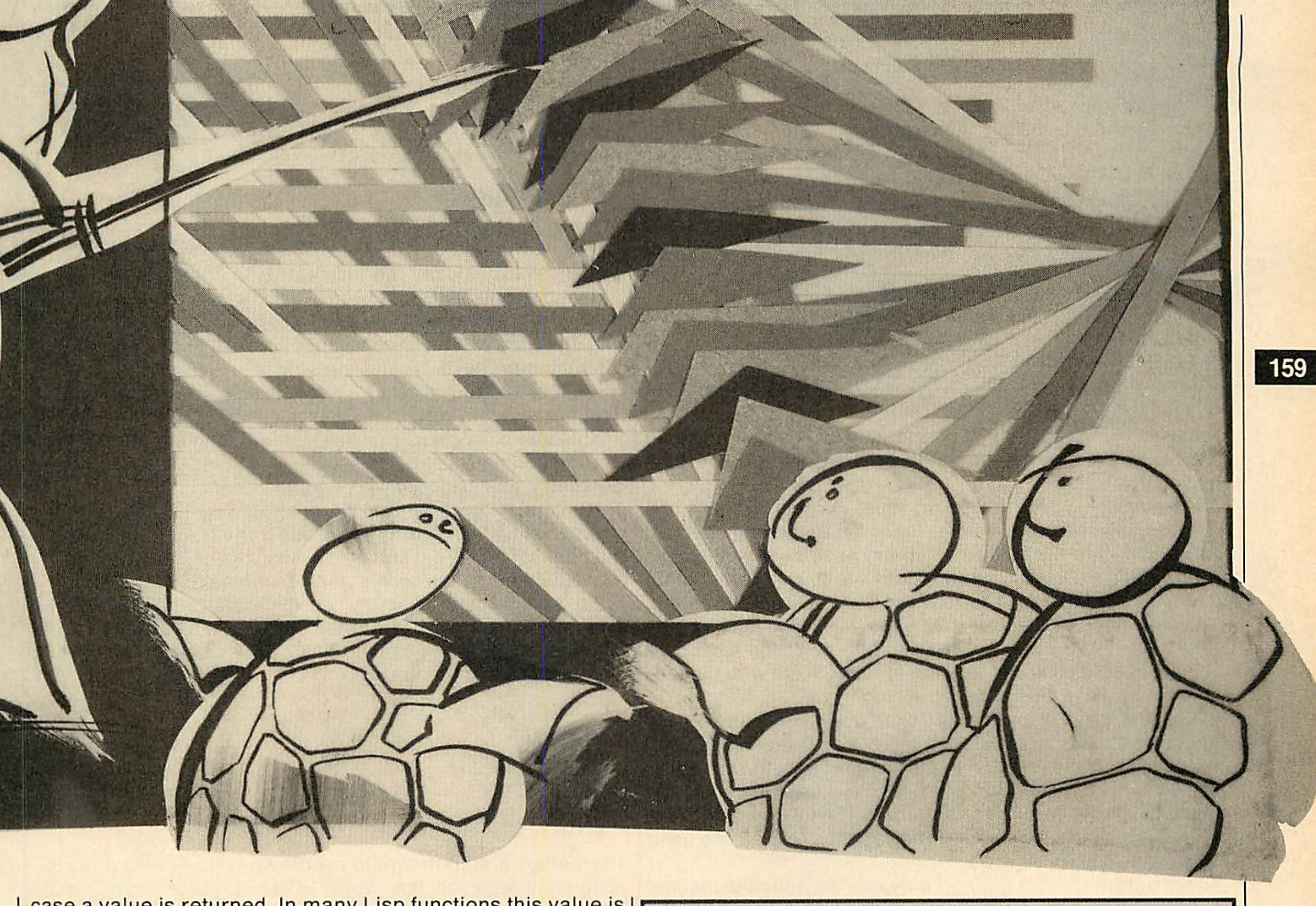


In addition, and unlike procedures or subroutines, a function always returns a value, which may be either numerical or a string. It may also return the logical variables true and false, which have the values −1 and 0 respectively in BBC Basic.

There are some situations where it is helpful to use a defined function even though no returned value is required. In this case a dummy result which is ignored by the rest of the program is returned. Anyone who has dabbled with Acornsoft's Lisp will probably already be familiar with the idea of functions which return dummy values. Programming in Lisp consists almost entirely of defining new functions in terms of existing ones. Each function is evaluated in turn and in each

TURTLE graphics provides a way of drawing geometric shapes on the screen, without the need for the user to have any knowledge of Cartesian coordinates and little geometry.

The article presents a turtle graphics program as an example of using functions and procedures. Readers who want to can just type in listing 2 and use it with youngsters, having studied the section headed 'Turtle graphics' and the box of commands (figure 1). Alternatively, the program is on the listing cassette (page 95).



case a value is returned. In many Lisp functions this value is of no significance to the rest of the program and is often either true or false. In other words, the functions are evaluated purely for their side-effects – the sequence of actions carried out within the function definition.

As an illustration of the use of functions in BBC Basic we'll build up three definitions, to be used later in the interpreter, which will split any text string into separate words and remove any superfluous leading or trailing spaces.

The task of the first function (figure 1) will be to remove any trailing spaces from the string. To those unfamiliar with recursion (again, an important part of Lisp programming), this definition may seem a little confusing. It may help to describe the actions of FNtrail line by line in plain English.

Line 1010 checks if the last character in the string is a space. If the text has no trailing spaces, no action is required. Exit from the functions returns the text unchanged.

If the program reaches line 1020 there must be at least one trailing space, so it re-enters the function using, as an argument, the string minus its last character (which line 1010 has established to be a space).

In other words, the function continues to call itself, removing trailing spaces one by one, until none is left. At this stage the string conforms with the exit condition in line 1010 and is returned as the value of the function. (Readers familiar with Lisp may well also notice a similarity between the structure of FNlead and many Lisp functions.)

A similar action could have been achieved without recursion and using a subroutine (figure 2) or a procedure (figure 3). In both cases, the processed string is not returned directly, but is placed in the string variable, A$, which contained the original string. Both non-recursive versions employ a GOTO statement, the use of which is now widely frowned upon, possibly unfairly. (Purists who shrink from using GOTO in any circumstances may well also shudder at my unconventional use of functions in Basic.)

```
1000 DEF FNtrail(A$)
1010 IF RIGHT$(A$,1)<>" " =A$
1020 =FNtrail(LEFT$(A$,LENA$-1))
```

Figure 1. Function removes trailing spaces

```
2000  IF RIGHT$(A$,1)<>" " THEN RETURN
2010  A$=LEFT$(A$,LENA$-1)
2020  GOTO 2000
```

Figure 2. FNtrail as subroutine

```
2000 DEF PROCtrail
2010 IF RIGHT$(A$,1)<>" " ENDPROC
2020 A$=LEFT$(A$,LENA$-1)
2030 GOTO2010
```

Figure 3. FNtrail as procedure

Next, figure 4, a similar function to remove any leading spaces. FNlead works in a similar way to FNtrail.

```
1030 DEF FNlead(A$)
1040 IF LEFT$(A$,1)<>" " =A$
1050 =FNlead(RIGHT$(A$,LENA$-1))
```

Figure 4. Function removes leading spaces

The next definition, FNwords in figure 5, will take the string without trailing spaces and split it into individual words, placing them into the array W$, which must have been previously dimensioned. A function of this type is invaluable whenever there is a need to analyse text input. In the interpreter, it will be used to look at the command strings from the

keyboard. This function returns, as its value, the number of words in the string. Since A$ is a local variable, the original string remains intact. Its operation is slightly more complex than the previous examples.

Line 1060 declares I% as a local variable (not strictly necessary at this stage but it is generally good practice to declare as local any variables which have no relevance outside the function). Line 1070 checks for a null string and if so exits, returning zero as the value of the function. Line 1080 removes any leading spaces.

```
1060 DEF FNword(A$) LOCAL I%
1070 IF LENA$=0 =0
1080 A$=FNlead(A$)
1090 N%=N%+1I%=INSTR(A$," ")
1100 IF I%=0 W$(N%) =A$:=N%
1110 W$(N%)=LEFT$(A$,I%-1)
1120 =FNwords(RIGHT$(A$,LENA$-I%))
```

Figure 5. Gives number of words in string

To reach line 1090, the string must contain at least one word; so the word counter, N%, is incremented and checked for spaces within the string. N% must have been set to zero before calling FNwords. It is not possible to reset N% within the function definition or to make it a local variable as this would cause it to be set to zero at each level of recursion.

Line 1100: if there are no spaces then the string must be a single word so it is stored and the function exits with the current word count as the value of the function.

Line 1110: there must be more than one word in the string. Remove and save the characters preceding the first space. Line 1120: apply the function to the remainder of the string.

The use of FNlead within the function effectively removes any extra spaces between the words. FNtrail needs to be applied once only to remove trailing spaces and can be used as the argument of FNwords.

The program lines in figure 6 may now be added to test the examples so far. Any sentence typed in will be split into its constituent words. The program may be terminated by typing 'QUIT'. Note that, in line 40, FNwords is used to return the number of words and at the same time has the desired side-effect of splitting the text into separate words.

A second valuable property of functions is that they may be called by name within a program, even where the name is held in a string variable. It is possible to call a function directly by a word entered from the keyboard via an INPUT statement. The turtle graphics program makes extensive use of this technique. Procedures cannot be called in this way. A series of IF . . . THEN statements would be needed. Alternatively ON . . . GOSUB or ON . . . GOTO is commonly employed where a choice of action is to be determined by keyboard input, but neither allows the calling of routines by name.

The technique used here is made possible by the use of the Basic EVAL function to evaluate a string. For instance, if the word 'fred' were entered from the keyboard and stored in the string variable F$, then it is possible to call FNfred using:

D% = EVAL ("FN" + F$)

This provides a simple way of determining which of a number of possible courses of action will be taken according to keyboard input. Try typing in, saving and running listing 1. On typing in a colour – either red, white or yellow – the background should change accordingly. Each function returns only true or false as its value and this is used to determine whether the REPEAT loop should continue or end. Only 'QUIT' will return the value false which is the required condition for termination. Note the concatenation of 'FN' and the input string which is passed to the EVAL function in line 60.

The defined functions are at first glance just returning a value of true or false but are in fact, as in the previous example, performing the required action as a side-effect; namely changing the background colour. This is a long-winded way of changing screen colours but does serve to illustrate the use of functions to control a loop while having useful incidental actions which are not necessarily connected with the calculation of the returned value.

Turtle graphics

The program shown in listing 2 makes use of the above principles to implement a turtle graphics interpreter. Turtle graphics is, basically, an alternative to the standard way of drawing a line on the screen. Turtle graphics removes the need for Cartesian coordinates by simply requiring the length and direction of the line to be specified. An imaginary turtle is instructed to move around the screen by telling it how far to more forward or how many degrees to turn right or left and whether or not to leave a mark as it moves.

This way of working also has particular advantages in generating geometric patterns where a knowledge of coordinate geometry and trigonometry would otherwise be required. Turtle graphics provides an environment where graphic, geometric and programming ideas can be explored without the need for any great knowledge in those fields.

In addition, this program allows shapes to be defined and later recalled with a single word. These shape definitions may be incorporated in further definitions to build up more complex shapes. For example, to define a square, you could simply type into the interpreter:

```
TO SQUARE
REPEAT 4
FORWARD 100
RIGHT 90
AGAIN
END
```

Thereafter, a square would be drawn at the current 'turtle' position whenever the word SQUARE were typed in or encountered in another definition.

The functions described earlier which make up FNwords are used to process command strings, typed in from the keyboard, which are then passed to FNinterpret to perform the appropriate tasks. Another function, FNlower, is applied to change all upper case text input to lower case so the program will work with capitals or small letters.

Recursively-defined functions are employed in several places. FNinterpret calls itself to execute user-defined words. Since defined words may contain further definitions, several levels of recursion may occur. In the case of interpreted repeat loops, FNinterpret calls FNrepeat which in turn calls FNinterpret to deal with commands within the loop. The actions of the other functions should be obvious from their names and the boxed summary opposite. Most of the command words can be abbreviated if terminated by a full stop. The minimum abbreviation for each is shown in brackets.

```
 10 DIM W$(20):CLS
 20 REPEAT: N%=0
 30 INPUT "Enter a sentence "A$
 40 words%=FNwords(FNtrail(A$))
 50 PRINT"There were ";words%;" words"
 60 FOR W%=1 TO words%
 70 PRINT W$(W%)
 80 NEXT
 90 UNTIL W$(1)="QUIT"
100 END
```

Figure 6. Splits sentence into words

Page 179 shows typical screen displays. The screen coordinates of the turtle, its angle and the scaling factor are shown in the status window. At a scale of unity, screen coordinates

COMMANDS USED IN TURTLE GRAPHICS

CLEAR (C.) clears the graphics window of the screen, re-setting the position of the turtle to the centre of the screen (coordinates 0,0), the turtle angle to zero and the scale (see below) to unity.

PENUP (P.) allows the turtle to be moved, using a forward command, without leaving any line. The turtle's new position is still shown by the pointer which represents the conceptual turtle and its screen coordinates appear in the status window.

PENDOWN (PEND.): when FORWARD is used to move the turtle, a line will be left on the screen. This is the default condition when the interpreter is first run.

RIGHT (R.) [angle] turns the turtle through [angle] degrees clockwise. Current direction is indicated by the pointer and is shown in the status window at the foot of the screen. The turning angle must be a whole number of degrees. If, say, RIGHT 12.5 were entered the turtle would turn only 12 degrees.

LEFT (L.) [angle] turns the turtle through [angle] degrees anti-clockwise.

FORWARD (F.) [distance] moves the turtle [distance] units in the direction currently indicated by the pointer and 'Angle' in the status window. Draws a line if PENDOWN is selected.

MOVE (M.) [X-coordinate] [Y-coordinate] moves turtle to absolute screen location, X,Y without drawing whether PENUP or PENDOWN is selected. Then screen coordinates are as standard in mode 1, ie four units horizontally and vertically per pixel, with the origin at the centre of the graphics window.

PENCOLOUR (PENC.) [colour number] selects the logical drawing colour. Either 1, 2 or 3 may be selected as foreground colours. PENCOLOUR 0 will select the background colour and may be used selectively to erase previously drawn lines. The default colours selected as 1, 2 and 3 are red, yellow and white respectively, and the background colour is black. These can all be modified using SETCOLOUR.

SETCOLOUR (SET.) [colour number] [actual colour] allows the colour displayed by any of the logical colour numbers to be defined. For example, SETCOLOUR 0 BLUE would set the background to blue. The colours available are black, red, green, yellow, blue, magenta, cyan and white. The colour names cannot be abbreviated.

THINLINES (TH.) causes lines of one pixel width to be drawn. This is the default condition when the program is run.

FATLINES (FA.) [line width] sets the thickness of lines drawn, where the number, linewidth, is approximately equal to the width in pixels. This is particularly useful for use on ordinary television sets.

OUTLINE (O.) [colour number] is a simple way of giving FATLINES an outline of a different colour. For example, the series of commands:

```
PENCOLOUR 1
FATLINES 6
OUTLINE 3
```

will cause subsequent lines to be drawn approximately six pixels wide in colour 1 and outlined in colour 3. OUTLINE 0 or OUTLINE OFF will disable this.

TO (T.) [shapename] allows a shape to be defined and later recalled by name (see the SQUARE example above). The sequence of actions entered following this statement will be performed whenever [shapename] is entered. The sequence is terminated by END. Such definitions may contain any other previously defined shape names.

REPEAT (RE.) [number] is used within a definition and causes the sequence of actions which follow to be repeated [number] times. The sequence is terminated by AGAIN, which cannot be abbreviated. Unlike the other commands, REPEAT has no effect as the definition is typed in but is active when the shape is called by name. REPEATs may not be nested within a definition but a REPEAT loop may contain shape names whose definitions themselves contain REPEAT loops.

SCALE (SC.) [number or fraction] allows the size of a defined shape or of lines within a repeat loop to be changed. SCALE is initially set to unity. The current value of scale is multiplied by [number or fraction] to give the new value, eg, if the scale is currently 4 and either SCALE .5 or SCALE 0.5 or SCALE ½ is entered, then the new value of scale will be 2.

SETSCALE (SETS.) [number or fraction] sets an absolute value scale. So if the existing scale were set at 16, SETSCALE ¾ would change it to .75 whereas SCALE ¾ would result in a scale of 12. If SETSCALE 2.5 were applied to SQUARE as defined above, then a square would be drawn with sides of 250 units.

SAVE (SA.) [filename] saves on tape or disc all definitions currently in memory. As is usual with disc files, names should not exceed seven characters in length.

LOAD (LO.) [filenames] loads a set of definitions.

LIST (LI.) [shapename] lists the definition of [shapename] at the left-hand side of the graphics window.

FORGET (FORG.) [shapename] allows the last definition entered to be removed from memory. Because of the limited memory available in mode 1, it has not been possible to include any means of editing shape definitions. If you need to change a definition, first LIST it as a guide and then FORGET it so a new version can be typed in. If you want to abandon a definition while it is being entered, complete the definition with an END and then FORGET it.

QUIT (Q.) exits from the program and returns to Basic.

The use of the escape key will not exit from the interpreter program but will halt any commands being processed. Its function is also to erase any shape definitions from memory and so needs to be used with care.

All commands are entered singly and followed by <return>. Commands and parameters are separated by at least one space. As mentioned above, commands may be entered in either upper or lower case, but are shown in figure 7 in upper case. The presence of the turtle icon (in the background colour, nominally black) at the left of the text window indicates that the interpreter is ready to accept commands from the keyboard. The icon disappears while the machine is processing direct commands. When a shape definition is being entered, the icon and any text subsequently entered changes to colour 1 (nominally red) as a reminder that an END is eventually required to terminate the definition.

As noted above, the effects of all commands except REPEAT are shown immediately and almost every command may be abbreviated to the minimum length required to distinguish it from others. Shape names may also be abbreviated when incorporated into new definitions.

follow the normal BBC screen convention, ie in mode 1, one pixel is four screen units high and four units wide. The origin is at the centre of the graphics window.

A few practical examples should help to familiarise you with how it all works. First try typing some FORWARD, RIGHT and LEFT commands to establish how the turtle moves.

Next, type CLEAR followed by:

```
to star
repeat 12
forward 400
right 150
again
end
```

Notice that only a single element of the star is drawn at this stage. Now clear the screen again with 'clear' or 'c.' and type 'star'. This time the full shape should be drawn. Try various values of SCALE to draw the shape in different sizes. To show how this definition can be used in a further shape, try:

```
to 3stars
left 15
repeat 3
star
right 120
again
end
```

Continued ▶

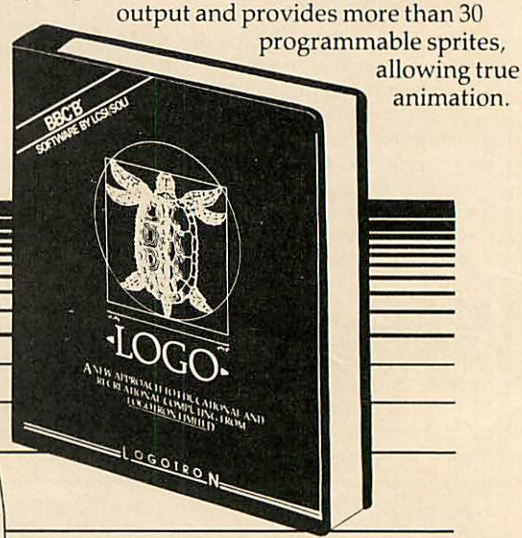
A full LOGO for the BBC model "B" from Logotron.

LOGO is a computer programming language, which appeals equally to children in primary school or to computer scientists at the Massachussets Institute of Technology. Using LOGO, you unconsciously absorb advanced mathematical ideas and fundamental principles of computer programming. LOGO has been available on microcomputers only since 1982. Only this year has it been made available on British home computers like the Sinclair Spectrum and the BBC Micro.

LEONARDO WOULD HAVE LOVED IT!

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Logotron's LOGO for the BBC "B" was written by LCSI/SOLI, the software house responsible for LOGO implementations for Atari, Apple, IBM, Sinclair, Coleco, and NEC. It's the closest there is to an international LOGO standard, with turtle graphics and full list processing. The software is contained on a single 16k ROM, written in 6502 machine code, fully compatible with the 6502 second processor unit and Econet. Facilities are provided to drive floor turtles, create and use data files, and access routines written in machine language. Full access is provided to the BBC micro's operating system. An optional sprite board, also provided by Logotron, can be used to handle video output and provides more than 30 programmable sprites, allowing true animation.



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LOGOTRON

Typing 'list 3stars' will list the definition at the top left-hand corner of the graphics window. If an undefined word is typed in, an error message will be generated.

For further variation, and to establish that the program is working correctly, try displaying the shapes you have just defined with various combinations of FATLINES, OUTLINE and in different colours.

The program was designed to operate in screen mode 1 to give good resolution, while still offering a choice of colours. As a consequence of the limited memory available to store shape definitions, it has been necessary to leave out features such as the ability to edit shape definitions and more comprehensive error trapping and reporting. Neither has it been possible to allow parameters to be passed to shape definitions as arguments of the shape name. This omission can be overcome to a large extent by writing definitions accordingly and using SCALE to vary line lengths within a repeat loop. The common turtle command BACKWARD has also been omitted to save memory. For those who wish to add their own commands, the following outline may help.

How the program works

The string array, C$, initially holds the names of the existing turtle functions, the first element, C$(0), holding the number of elements (21) used to store them. As definitions are entered, they are added to the array and C$(0) is updated.

When a command is entered from the keyboard, it is passed to FNinterpret which searches to find the first occurrence of a match to the first word in the command string. If there is one within the first 21 elements of the array, C$, the command will have been one of the in-built functions. The appropriate function is called by name, eg, if the word, 'pendown', or its abbreviation is entered then FNpendown will be called using the EVAL technique outlined earlier. All of these functions except FNquit return a value of true. FNquit returns false and ends the program.

If a match has been found beyond the first 21 elements of the array, its position will mark the head of a shape definition. The words which follow in the array, up to END, are then processed similarly by FNinterpret calling the in-built functions and further processing shape names where necessary. If no match for the command is found, a warning is given that it has not been defined.

Memory limitations

It is essential for disc users to set PAGE to &1300 before loading and running the program to have enough memory for definitions. Don't, however, set PAGE to &1300 until you have typed the listing in and saved it.

If you press break while debugging the program, you will probably find the program corrupted if PAGE is set lower than &1900. Most of the commands can be tested without resetting PAGE, so you can establish that the interpreter is generally working before doing so.

The most convenient way of setting PAGE is to *BUILD a !BOOT file:

```
0001 PAGE = &1300
0002 CHAIN "TURTLE"
```

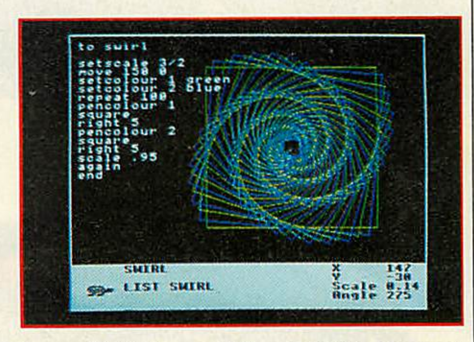
and then enter *OPT 4,3 so the disc can be booted by pressing the shift and break keys together.

The above comments apply only to disc users. The problem of memory space does not arise with cassette or if you have a 6502 second processor or RAM extension board such as the Aries. It should be possible to increase the size of string array C$ in line 2500 by about 50 elements for every extra kilobyte of memory available.

Similarly, abbreviations will help make best use of storage space. There are theoretically 79 array elements available, each capable of storing one line of definition.

If you have access to a program compacting utility such as in Beebugsoft's *Toolkit* and Vine's *Addcomm* then it's possible to save about 500 bytes, although the resulting program is much more difficult to read or de-bug. This is achieved by removing spaces, using multi-statement lines and a global search and replace utility to shorten long variable and procedure names.

To free even more space for shape storage or to add extra commands, the program could be run in mode 5, but the text part would need modification to allow for only 20 characters per line. Similarly, if you are prepared to sacrifice the ability to display four different colours simultaneously, mode 4 will free 10k of memory for definition storage and the screen text layout will need no adjustment.



The illustrations accompanying this article show some more programming examples together with listings of the definitions used. The additional shape definitions required by these examples are listed separately. SQUARE has been defined in a slightly different manner to that shown earlier so it can easily be rotated about its centre.

Finally, a few tips which may help you define shapes. In general, any regular [N] sided polygon of side length [L] can be defined as:

```
to polygon
repeat [N]
forward [L]
right 360/[N]
again
end
```

As the number of sides is increased, the shape will approach a circle. Incomplete polygons, eg, a hexagon with one side missing, are useful components for designing patterns.

FATLINES can be used as a convenient means of drawing solid squares and rectangles. Remember that the argument of FATLINES is in pixels (one pixel width = four screen units at unity scale).

Although all the examples shown are of geometric patterns, the interpreter is also suitable for defining less abstract shapes. For example, FACE could be defined in terms of CIRCLE, EYE, NOSE etc, and likewise HOUSE in terms of RECTANGLE, ROOF, WINDOW.

If you want to get more adventurous then it's possible to specify distances, angles and scales in terms of each other. The variables 'xpos', 'ypos', 'angle' and 'scale' hold respectively the X and Y coordinates of the turtle, its angle and the value of scale. It is therefore valid to enter: right ypos or forward angle-10 or even left (xpos + ypos)/3.

Any expression used as an argument must not contain any spaces. The resulting patterns are far less predictable and will require a certain amount of experimentation. It's easy to lose the turtle off the edge of the screen, but at least you can tell where it's gone from the status display.

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SOFTWARE CHART

		TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1	(1)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
2	(—)	Sabre Wulf	Ultimate	£9.95	B	
3	(5)	3D Grand Prix	Software Invasion	£7.95	B	January '85
4	(3)	Jet Pac	Ultimate	£7.95	B	
5	(16)	Manic Miner	Soft Projects	£8.95	B	
6	(2)	Frak!	Aardvark	£7.50	B	September '84
7	(10)	Eddie Kidd	Martech	£7.95	B/E	
8	(6)	Football Manager	Addictive	£7.95	B	
9	(—)	Scrabble	Leisure Genius	£12.95	B	
10	(—)	Bird Strike	Firebird	£2.50	B	
11	(8)	Mr EE	Micro Power	£6.95 (£9.95)	B	
12	(7)	Pole Position	Atarisoft	£9.99	B	
13	(11)	Micro Olympics	Database	£5.95 (£7.95)	B/E	
14	(4)	Fortress	Amcom	£8.95	B	September '84
15	(15)	Twin Kingdom Valley	Bug-Byte	£9.50	B/E	
16	(—)	Mini Office	Database	£5.95 (£7.95)	B/E	
17	(—)	Return to Eden	Level 9	£9.95 (£11.95)	B	
18	(re)	Chukkie Egg	A&F	£7.95	B/E	September '84
19	(re)	Zalaga	Aardvark	£7.50	B	
20	(12)	Chartbusters	Alligata	£9.95 (£13.95)	B	

B = BBC. E = Electron. Prices in brackets are for disc version. r = re-entry.

BUBBLING UNDER

Mineshaft (Martech)
Swag (Micro Power)
Duck (Firebird)
Dare Devil Dennis (Visions)
Snooker (Visions)
Hobbit (Melbourne House)

Compiled by RAM/Computer

NO MESSING around this month as the amazing *Sabre Wulf* finds its way straight to the number two spot as the highest new entry. No doubt the Ultimate aim is to reduce *Elite* to a harmless hasbeen – who is this Commander Jackson anyway?

Software Invasion's *3D Grand Prix* has opened up a nine place lead over Atarisoft this month, whose *Pole Position* has been overtaken. Hard on the heels of the pace-setters, Soft Projects have a new entry in *Manic Miner*, while their *Jet Pac* slips a place to occupy the number four position. Aardvark may be a little upset over their slight fall from number two to six, but there is no truth in the rumour that their managing director said *Frak!* (or anything similar) on receiving the news!

With falling attendances at recent soccer matches, it's not really surprising that Addictive's *Football Manager* is going the way of many others. While on the sporting front was Database disappointed by the fact that not one of its *Micro Olympics* team was in the running for a BBC sports personality of the year award? And is it true that complimentary copies of its *Mini Office* are to be sent to the BBC to help with the future collation of nominations? Also 50 points to Leisure Genius for full use of its letters in getting *Scrabble* to the number nine spot.

British Telecom's Firebird label flies into the charts again this month, with new entry *Bird Strike*. The £2.50 price tag is obviously paying off, with sales for all titles running at 100,000. Level 9 get another byte of the apple with the entry of Return to Eden in the charts, while two re-entries are the poaching game *Chukkie Egg* from A&F and *Zalaga* from Aardvark on a second wave attack. In view of its anchor position in the charts this month the Alligata title, *Chartbusters*, seems rather unfortunately named.

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GENDER
OCCUPATION
PLACE
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DATE of DEATH/BURIAL
No. of CHILDREN
SPOUSES (Up to 3)
DATES OF MARRIAGE
REMARKS/NOTES



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* *No. of CHILDREN*
* *GENDER of CHILDREN*
* *PERIOD of YEARS*
* *ANY FOUR GENERATIONS*
* *LONGEVITY*

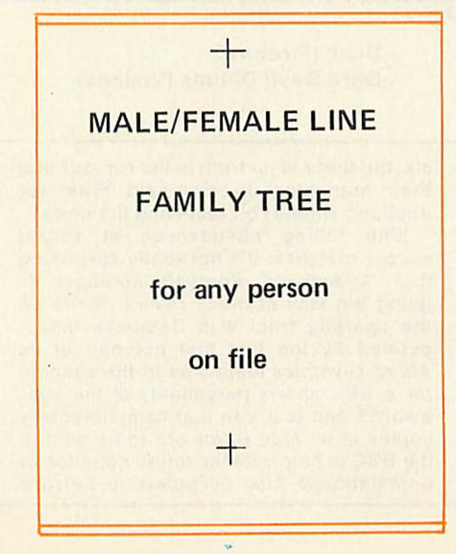
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Jeff Ashurst is your guide on a tour of how they work, and visits six in particular

THIS IS THE MODEM WORLD

CHOOSING communications hardware and software can be very confusing – how do you know which facilities you need and which products will suit your intended applications? In this, the first of a two-part review, I'll look at modems: what they are, what they do and the different features offered by specific models. Next, I'll look at the software.

In microcomputer communications we use the public switched telephone network (PSTN) to transfer data between devices at remote locations. To do this, it's necessary to make two changes to the format of the information handled by the sending and receiving computers from the way it is dealt with internally. First, from parallel to serial transmission: second, from digital signals to analogue frequencies.

Parallel/serial

Information inside a BBC micro, Electron or Atom is carried around in eight-bit bytes. Each of these bits moves along its own path parallel to the other seven analogues to an eight-lane motorway. This is fine for short distances, but as the length of wire increases, the standard of data transfer decreases. This is because the speed of transmission along each cable varies, so bits sent out together arrive at different times and are interpreted as garbage. (This problem, 'data skewing', explains why parallel ribbon cables for printers are limited to 1.5m.)

So for communication, data is sent serially, with each bit following the other. Incoming sets of eight-bits are then collected into bytes for processing.

We therefore need to transmit and receive information serially, that is one bit at a time. The eight-bit, bytes are sent, in order, bit by bit and incoming serial bits must be collected into sets of eight for processing as bytes within the receiving computer. This two-way conversion is the function of a chip in the circuitry of the BBC's RS423 interface known as the Asynchronous Interface Adaptor or ACIA. I'll explain the word asynchronous later.

For a good analogy of the parallel – serial – parallel conversions, imagine a squad of soldiers marching eight abreast, then peeling off row by row to enter a doorway and pass down a corridor in single file, finally emerging through a door at the other end to reform and proceed in the same rows of eight. Here the corridor represents the telephone network.

Having accepted the need for serial data handling, it is clear the telephone network, although having only two wires to carry data, can provide our channels – our communications medium. It's a ready-made network offering dial-up access on a world-wide basis!



Telemod 2 from OEL

However, telephones were developed for voice transmission within a fairly narrow bandwidth of frequencies. These frequencies are analogue (ie variable) quantities, whereas computers work in digital signals which have two states only, off and on, representing the binary 1s and 0s. Therefore, after parallel data has been converted to serial format, a second two-way conversion must take place, to change serial digital signals into analogue frequencies. And *that* is what a modem does.

It MOdulates outgoing digital signals to frequencies for transmission, and it DEModulates incoming frequencies to digital signals for processing. Hence *modem* (figure 1).

The variables

There are many variable parameters to be agreed before two computers can communicate, but fortunately these are embodied in international standards which specify such things as transmission speed and telephone line frequencies. For successful dialogue; communicating devices must comply with the same standard, both in the configuration of their hardware and the action of their software. They must work to the same rules and conventions – the same *protocol*.

There are fundamentally different methods of data transfer – under synchronous or asynchronous protocols. Synchronous transmission involves the sending of a number of bits, together with start-of-message and end-of-message signals and some coding to enable the timing clocks of the sending and receiving devices to synchronise with each other.

Most microcomputer communication is asynchronous. That is, it consists of the transmission of information character by character, with a variable gap or idle period between them. So this article is concerned with hardware and software conforming to standard *asynchronous* protocols.

Data can flow between computers either in two directions simultaneously or one direction only, depending upon the protocol used. Two-way communication is known as *duplex* (or sometimes full duplex). A modem transmits the binary 1s and 0s as two different frequencies, and 'listens' on two other frequencies for incoming data.

Therefore duplex communication uses four separate frequencies simultaneously. For the modems at opposite ends of the line to receive and send on different pairs of frequencies one of them must be switched into *originate* mode, and the other into *answer* mode.

The host micros of bulletin board systems will have their modems in answer mode. In direct user-to-user communication the parties must agree beforehand which mode to set their

If this review whets your appetite for information on communications, see our feature in the July 1984 issue (pages 27-39) and our guide to bulletin boards on pages 167-170 of the October 1984 *Acorn User*.

modems in. They must be set in opposite modes – it doesn't matter which. One-way data flow, or *half duplex*, uses two frequencies only, with parties taking turns to be sender and receiver. This is directly analogous to CB radio communication, where the listener can't reply until the speaker switches 'over'.

Transmission speed, measured in bits per second, is a critical parameter. The normal range of speeds used by different devices is from 75 bits/second (baud), increasing by factors of two through 150, 300 etc, to 19200 bits/second. The PSTN has a practical upper limit of 1200 bits/second.

Remember the soldiers in rows of eight? Well, the analogy holds, but in practice when a byte is sent it must be preceded by a *start bit*, to announce that information is following. It must also be suffixed by at least one *stop bit* to signify the end of that byte. Hence a character will typically be sent as a 10-bit *word*, consisting of the eight-bit byte sandwiched by the two *framing* bits.

When a key is pressed and the software sends a character out through the RS423, the ACIA automatically sends a start bit to say, in effect, 'read the next nine bits'. The remainder of the word format – the number of data bits, a form of error checking called the parity check (if any), the number of stop bits – is set by the software.

So we're talking about asynchronous protocols and the variables are full or half duplex transmission, transmission speed and the actual frequencies used by the modems to send and receive data.

International standards define the protocols in which all these variables and many other parameters such as electrical characteristics and connection details are precisely specified. Equipment conforming to recognised standards reduces the setting of all the variables to simply plugging in the right 'black box'.

The Consultative Committee for International Telegraph and Telephone (CCITT), a sub-committee of a United Nations agency, lays down standards through its Study Group XVII. These are published by the International Standards Organisation (ISO) as the 'V-series' recommendations.

CCITT standards are adhered to in most parts of the world, with the notable exception of the United States, where modems developed at Bell Laboratories and supplied by associated telephone companies were first in the field, and so became, in effect, an industry standard. Of the recognised standards, we are interested in CCITT V21 and V23, and Bell 103.

V21 modems receive and transmit at



Nightingale from Pace

300 bits/second. This standard is used by most of the free public access systems and by commercial electronic mail services such as BT Gold.

V23 is the viewdata standard, with a main channel sending at 1200 bits/second, (ie, from the viewdata mainframe to the micro terminal), and a secondary or 'back' channel of 75 bits/second. The split speeds of this standard, known as asymmetric duplex.

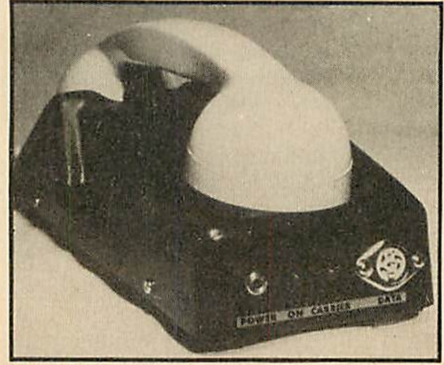
Incidentally, there are three ways of setting up user-to-user communication, according to modem and software available. The first is at 300 bits/second with modems switched into opposite modes, one originate, one answer. Secondly, some modems which support V23 have a so-called 'reverse Prestel' mode, enabling transmission at 1200 bits/second and reception at 75. This will therefore allow a 1200/75 to 75/1200 asymmetric duplex link.

The third way is to use software which will automatically switch V23 modems between originate and answer so that each in turn sends and receives at 1200 bits/second, giving 1200/1200 half duplex communication.

Modems to Bell 103 standard use equal receive and send rates of 300 bits/second, the same as V21, but utilise different telephone frequencies, and so are not compatible with V21. Some UK bulletin boards are now dedicating certain hours to receive calls from V23 and/or Bell 103 users (see *Acorn User* October 1984, page 169).

Comparing modems

In any assessment of computer equipment, it's unrealistic to divorce hardware and software, but the following



OEL's PAC-M1

look at a cross-section of the types of modem available is principally a study of the physical and functional attributes of the hardware. However, remember the ability of the hardware to do anything depends upon the use of suitable software, which I'll discuss in part two.

I have split the features offered into two categories – essential or desirable. Compliance with a particular protocol is an essential requirement, while a self-test facility and an on/off switch are merely desirable. There is no clear cut division – for example, if you wish to run a host system an auto-answer facility becomes essential.

Top of the essential list comes approval for connection. Most people are now familiar with the green circle and red triangle stickers on equipment designed for use with the PSTN. Green signifies approval to connect, while the legend over the red triangle begins 'Prohibited from direct or indirect connection. . .', and adds that 'Action may be taken against anyone so connecting this apparatus'.

It is an offence for the retailer to sell an unmarked product. It *must* carry one or other sticker so the decision as to whether to ignore the warning is placed squarely upon the purchaser.

The units tested connect to the telephone network in different ways, as shown in figure 2.

Some of the hard wired modems incorporate telephone sockets, whereas with others an adaptor (or a double socket) is necessary to connect both telephone and modem. I liked the idea of being able to jack the telephone into the modem. It makes a neater arrangement and, as the modem is 'transparent' to the telephone user and the connection does not depend upon the modem being under power, it effectively gives an extended lead which can be convenient when using the telephone alone.

I'll now look at each product in turn – all dimensions are given in the format breadth × depth (front to back) × height. Table 1 summarises what each has to offer and in table 2 I give them marks out of 10.

SCM-100

The most striking thing about this pale grey unit is its size, a compact 138 × 190 × 48 mm. So what? Well, it has no buttons, toggles or switches of any kind, that's what! The only external features are a telephone socket and a single LED, both in the front panel. In addition to power, RS423 and telephone cables, the SCM-100 also sports a 20-way ribbon cable.

This is a modem totally controlled and configured by software, and is marketed together with a ROM chip as a

hard/soft package. In this context it is puzzling to read in Loco Systems' advertisements that the modem is 'compatible' with 'Termi etc', when only their own ROM contains the configuration commands.

I found it almost impossible to separate and comment only on the hardware of such a tailored package. The ribbon cable connects to the BBC's user port through which the computer addresses the modem using a set of 12 extra OS commands provided by the software.

A simple command, *MODEM, followed by parameters O/A (for originate/answer), 300/1200, UK/US, replaces the buttons or switches for configuration used on other modems. Other straightforward instructions like *LOGON and *TALK are used in going on-line, while *DIAL and *AA bring in this versatile unit's auto-dial and auto-answer functions respectively, (although to act as host in auto-answer mode you need to write the software).

The manual, although a little brief on some points, covers all aspects of setting up and use from fitting the controlling ROM to a description of the extra OS commands and function key definitions. The way the f-keys are set up differs according to whether 300/300 or viewdata mode is in use, but in either case the functions can be listed instantly on screen at a single keystroke, from memory.

I was impressed by the separation of computer-modem control commands via the user port, from data via the RS423 interface. It seems such a sensible thing to do. A second difference between this and other modems reviewed is that it takes its power supply directly from the computer. If you are also running disc drives this way, you will need the adaptor (£5.95).

Nightingale

At 180 × 195 × 60 mm, this unit is also sized to stand under a telephone, but its shaped sides and beige front panel combine to make it appear less like a cube. A telephone socket is provided in the back panel. This is a multi-standard modem based on the AM7910 chip. Protocols supported are V21, V23 and Bell 103.

The modem is configured using four two-position push-buttons in the front panel to select between off/modem connect, originate/answer, 300 bits per second/viewdata and CCITT/Bell. Clear, unambiguous markings define the function of each button, and you can see how to work them at a glance.

A fifth push-button, in the back panel, switches in a self-test facility in which outgoing data is looped back through the receive circuitry.

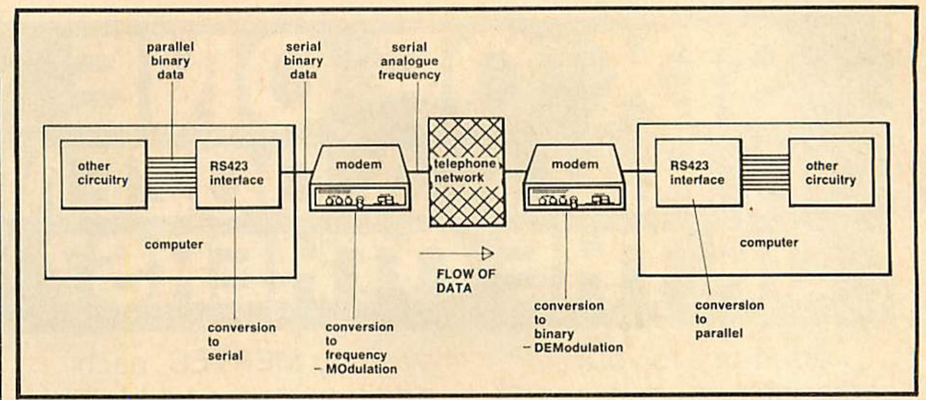


Figure 1. The chain of connection between two computers via the telephone network

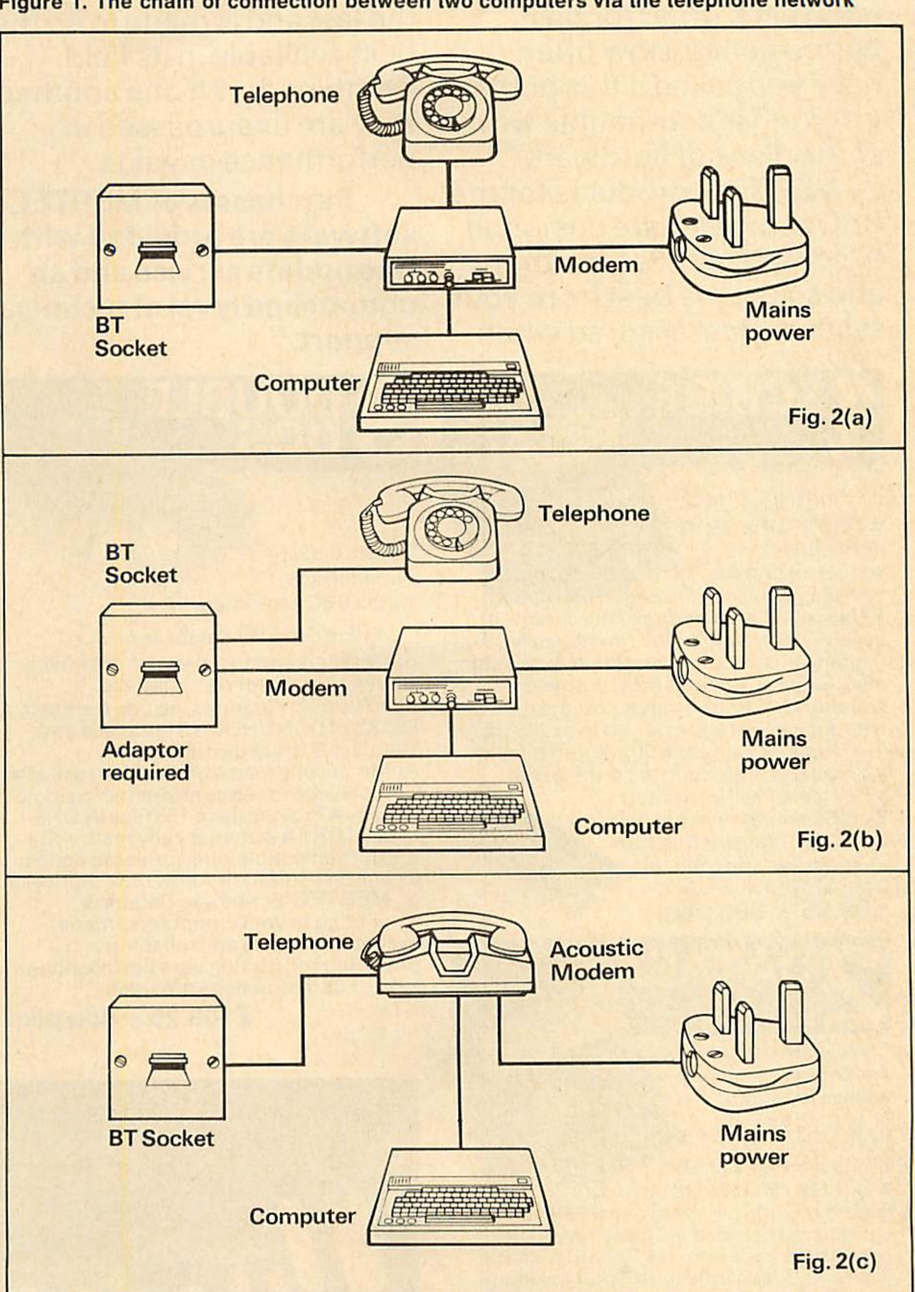


Figure 2. Three ways modems can connect to the telephone network and computer

With 'originate' and 'viewdata' selected, the modem will send at 1200 bits/second and receive at 75 (the 'reverse Prestel' mode referred to earlier). Thus user-to-user communications is possible even with someone who has a V23 viewdata-only modem.

Two LEDs on the front panel, marked 'carrier detect/line hold' and 'power/data', indicate what's going on. The former glows yellow when the modem has locked onto a carrier generated by a remote host. The latter glows red when under mains power, but flashes bright

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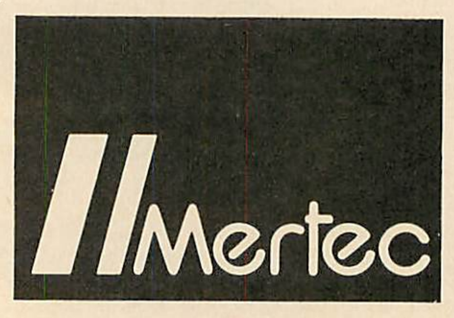
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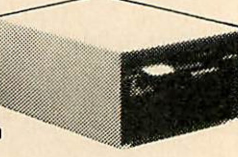
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red when data is being received and green to denote outgoing data.

I had a provisional copy of the documentation which covered all points and gave detailed instructions on setting up and using the unit, together with a quick-start guide, and Pace has now produced a more comprehensive guide.

The Nightingale is simplicity itself to handle. Although naturally Pace would like you to purchase their own software to use with the modem, the fact that it doesn't rely on any special configuration commands leaves that decision up to you – a refreshing marketing policy these days.

Prestel Adaptor

Acorn's offering is a V23 modem, supplied with some sophisticated firmware. At £99+VAT it represents good value for money, when you consider that ROMs normally sell for £35-£40.

It's housed in a profiled box similar to those of other add-ons, in BBC beige with a brown panel, making a handsome mate for the computer on your workstation.

For the record, it measures 205 × 345 × 72 mm and while its horizontal upper surface is not big enough to stand a telephone on, I don't think one would want to. The unit does not have a telephone socket, but has an on/off switch in the rear panel, saving all the kneeling down to plug in and out.



Acorn's Prestel Adaptor

In operation, the Prestel Adaptor is wholly software controlled, so see my next article for more on the facilities provided.

This modem, like several others, uses the RS423 link to receive and respond to commands from the BBC micro. It makes full use of the function keys not only alone, but also with shift, control and control shift. Modem control commands and Prestel commands are abbreviated in this way.

Prestel is accessed by entering CALL (using f3) and, when prompted, keying in the telephone number. Autodialling follows, and a small speaker provides audible monitoring of the process. Additionally, on-screen messages keep the user informed of the state of play.

	SCM	Night'ale	Telemod	Prestel	Protek	PAC
price incl. VAT	£149.95	£136.85	£84·95	£113.85	£59.95	£99.95
BT green sticker	★	●	●	●	●	●
protocols: CCITT V21 (BTG)	●	●				
CCITT V23 (Prestel)	●	●	●	●	●	●
reverse V23		●				
1200 half-duplex	●		●		●	
Bell 103	●	●				
originate and answer modes	●	●	●		●	
self test	●	●	●			
auto-dial	●			●		
programmable tel. nos.						
auto-answer	●					
telephone socket	●	●	●			
sized to telephone	●	●	●			
on/off power switch				●	●	

★BT approval applied for

Table 1. The facilities offered by each modem

	SCM	Night'ale	Telemod	Prestel	Protek	PAC
ease of use	4	8	7	8	5	7
documentation	7	6	5	9	4	3
range of protocols	8	8	4	2	4	2
range of features	8	4	4	4	—	—
overall useability	5	6	6	7	5	5
overall rating	32	32	26	30	18/40 × 2	17/40 × 2

Table 2. How they score out of a possible 50 points (acoustic couplers out of 40)

The documentation earns top marks for Acorn. The spiral-bound 'Prestel System User Guide' is a manual covering the hardware, the software and the Prestel system in general. To its credit, it includes sub-sections on problems you may encounter and suggests remedial action.

This viewdata package will stand comparison with any other. If only it had been a multi-standard modem....

PAC-M1

This is OEL's acoustic V23 modem, and is a sister to their similar PAC-M2, a V21 version. Unlike the Protek, the PAC-M1 is designed to take only the standard BT handset.

Built on an aluminium base, this one-piece unit measures 253 × 90 × 74 mm. The cups to take the telephone handset do not use rubber or foam to isolate ambient noise, but rely on accurate moulding of the casing. After the Prestel modem's whistle is heard down the phone line, you snap the handset into place using a fairly firm pressure. This process is much easier if the mouthpiece is entered into the modem's cup first, because of their different angles.

Documentation supplied was limited. It is difficult to write reams about a single standard acoustic modem, but something like a user guide would have been more appropriate.

Protek 1200

Of the two acoustic modems looked at, this is the more portable. It runs on four 'R6' or 'HP17' size batteries, and doesn't have provision for mains connection. Being very light, compact and measuring 265 × 86 × 54 mm, this type of device is ideal for the travelling communicator. One can visualise an executive reporting back to head office from a hotel room, using a lap portable and a Protek modem, or for those a little lower down the company tree, from a phone box.

The unit is best described as two shallow boxes connected by a flexible centre section, each box housing a rubber-rimmed and foam-lined circular cup. I used it with what is now the old style BT handset, and it performed without fault. From its construction, I imagine that it would, to a degree, accommodate other handsets with circular ear and mouthpieces of similar but not identical proportions to the standard BT set. If you own a non-standard BT telephone and are contemplating a purchase, check first that this modem works with your specific make and model.

A separate interface pack is sold with the modem so it can be used with different computers. For the BBC this contains instructions, connecting lead and cassette software to support V23 and user-to-user communication with another Protek 1200. The documentation deals briefly with use and technical specification.

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Access a world of Information
WITH YOUR BBC MICRO

Today, there are literally hundreds of databases worldwide which can be accessed by your BBC micro. These include Prestel, Micronet, Homelink, Telecom Gold, various 'Bulletin Boards' and massive American data bases such as 'The Source' and 'DIALOG'. The equipment can also be used to send telex messages. The Pace range of inexpensive communications products are designed to provide accurate data exchange whilst being extremely flexible and easy to use.

NIGHTINGALE - The Modem



Nightingale is by far the most versatile modem available, at the price, for either home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between the BBC and other computers, including bulletin boards.

Nightingale has a built-in expansion capability, allowing the addition of auto-answer and auto-dial with battery back-up. The state-of-the-art modem chip technology employed in Nightingale requires minimal support circuitry resulting in low power consumption, low cost, high quality and extreme reliability.

Nightingale being 'hard wired' is not subject to the noise interference errors common to outdated acoustically coupled devices. In addition Nightingale features a simple self-test facility for easy installation.

Nightingale utilises a fully buffered RS 423/232 serial interface and is supplied complete with a lead suitable for connection to the BBC micro, other leads are available on request.

In order to use a versatile modem like Nightingale to its fullest potential, you will require equally sophisticated software. This is where Pace can offer you a total solution — Commstar, unquestionably the most comprehensive communications software available for the BBC.

Commstar is currently the only package for the BBC micro which offers easy access to Prestel (and other viewdata services), together with user to user communication and exceptional file transfer capabilities.

Supplied on Eprom, Commstar is instantly accessible, simple to use and extremely flexible. Just look at the possibilities:- access Prestel, Micronet, Viewfax, Homelink and Telecom Gold, rummage through bulletin boards and chat to literally thousands of other computer users, but there's more. Commstar's versatility enables the BBC to be used as an inexpensive work station for a main frame or mini-computer.

COMMSTAR - The Software



The complete Nightingale/Commstar package for the BBC micro including the modem, cabling and the Commstar Eprom and manual is just £139 plus V.A.T.

Nightingale is available separately for the BBC and other computers at £119 plus V.A.T. and Commstar is £29.57 plus V.A.T. Further details are available, please telephone or write for comprehensive fact sheets.

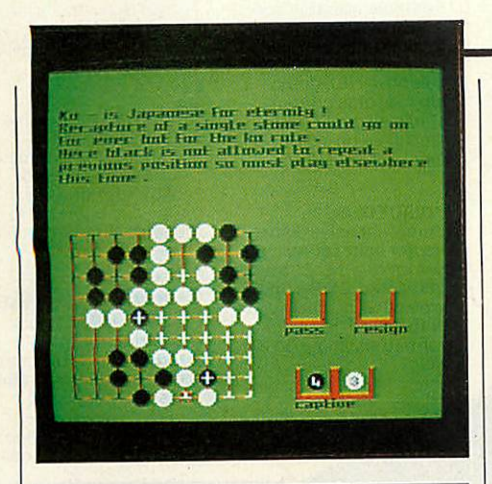


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Go-ing to rival chess?

'Microgo 1', Edge Computers, 3 Junction Road, Reading, Berks RG1 5SA, BBC and Electron, £9.95

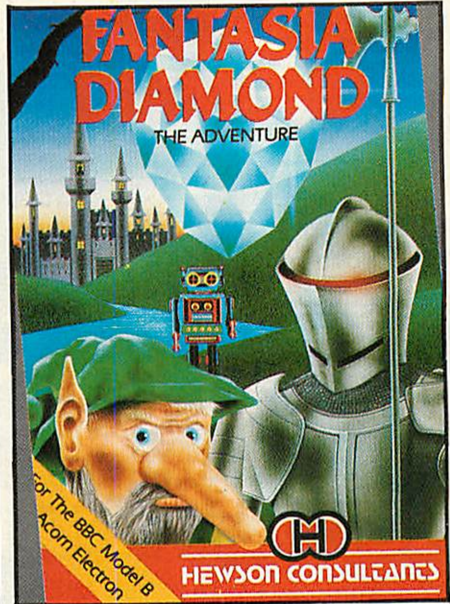
EDGE Computer's *microgo 1* comes smartly packaged in a video-cassette style case with an insert giving loading instructions, control key summary and a description of its nine skill levels. The program is recorded four times on the cassette, which in my case was as well, since two of them wouldn't load. Once in the machine, however, the game was handled faultlessly.

Go is claimed to be the most popular game in the world, but has only been played to any extent in the West over the last thirty years. Each player takes a turn to place a 'stone' of his/her own colour on a board of eight by eight squares. As more stones are positioned, situations usually arise where one player can capture his opponent's pieces. To this extent it's similar to the game *Othello*. In *Go*, however, the pieces are placed on the junctions of the squares rather than within them, and the game is as much to do with securing territory as it is with the capture of stones.

Microgo 1 displays the board in the bottom left-hand corner of the screen with instructions above. To the right of the board are various bins, in which captured pieces are held or unplayed stones are placed to indicate a 'pass' or resignation. The program uses a good animated effect to eject each stone the computer plays into a neat parabola which terminates at its desired playing point.

It incorporates many of the features of computer chess programs – handicapping, swapping sides, computer *v* computer games and indication of potential territory. I hope, however, that the production version includes a more complete description of the game than the one on the press release, and that the demonstration game may be played at a rate determined by the user and not the computer. There are several aspects of the game not adequately explained in the documentation but, nonetheless, I'm glad to have been introduced to what seems a very viable alternative to chess.

Simon Williams



A diamond of many facets

'Fantasia Diamond', Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX. BBC B and Electron, £7.95

THIS text only adventure will appeal to young and old alike. Having a vocabulary of over 300 words, you can give multiple statement commands of up to 62 characters in length – a pleasant change from the two words and Ugh! reply routine that several adventures on the market give.

I counted only 72 locations, but don't let this put you off – the amount of characters and their antics compensate.

The object is to recover the massive Fantasia Diamond and the missing Masterspy Boris who's already tried to get it back and failed. Finding food and drink to maintain your strength is very important – I often found I was too weak to pick up the food I needed to keep going, but I managed to complete it after many a frustrating hour. Wait till you get to the Music Room and you'll understand what I mean.

You may order some of the characters to carry out your wishes, but beware – they sometimes do what they want as they have minds of their own.

Pressing the Escape key provides a repeat of the last command given, which can save quite a lot of typing, and by typing Pause the game is frozen – it restarts when the next command is given – so the game can be saved.

I did come across one bug in the program when trying to quit the game. The prompt QUIT Y/N?, came up on the screen and I found that pressing either key had no effect, only on pressing W did the game restart.

On the whole I found this game enjoyable to play. The instructions are adequate, the packaging attractive, and it's good value at £7.95.

Dave Morgan

Things that go bump in the night

'Nightmare Maze', MRM, BBC (32k) and Electron, £5.95

IN this maze game the idea is quite simple – all you have to do is collect the required amount of keys (the number needed is displayed at the bottom left of the screen) and then run to the door.

This is complicated by the fact that there are a number of Deadly Denizens of Dream World chasing you – if the Denizens don't get you then there is a fair chance the time limit will.

You take the part of Sleepy Joe who is in the middle of an endless nightmare. He can only escape by getting all the keys and moving on to another



room. This is filled with even worse nightmares and Joe's only chance to wake up is to have a cup of black coffee which livens him up for a few seconds.

There are four different mazes, each with its own breed of Denizen. It makes use of excellent mode 2 graphics but there is only a small quantity of sound and no tune with the game. The characters are completely flicker free. Apart from the lack of sound, my only criticism is that it takes a lot of practice to get Joe around a corner.

Richard Lukins


NEW
16k EPROM
*HEX, Is a full HEX dump, displaying 8 bytes of HEX and ASCII equivalent per line. A status line shows the current address and the byte at this address in:- HEX, ASCII, Decimal and either the binary, basic token or assembler mnemonic. Forward and reverse scrolling of the display at normal and high speeds is a feature, as is a full on screen memory editing facility which allows inputs in either hexadecimal, ASCII characters or assembler mnemonics.
*MON, Serves the same function as *HEX, but the display is in disassembled opcodes, rather than *HEX. The editing and scrolling facilties are the same as for *HEX. An additional feature of *MON is the ability to directly follow JSR's, branch's etc.
*DEBUG, A full featured program debugging aid, allowing the programmer to see the most intimate details of the program under examination. Features, variable speed, single stepping, breakpoints, continuously updated disassembler, selective HEX dumps (up to 6) plus current stack, all continuously displayed on screen, plus many other features.
*DISCED, A comprehensive disc sector editor enabling any sector of a disc to be read, inspected, edited and written back. It will work with any 40, 80 or dual formatted single density disc.
*DGET, Searches a disc for all occurances of a string or group of bytes.
*REL, Enables machine code to be easily moved around in memory, automatically adjusting JSR's, JMP's etc.
*SLOW, This command causes the entire computer to slow down to any variable speed between 1 and 255. This can allow the in depth study of graphic's methods etc.
*EDIT, A dynamic basic screen editor, cursor controlled with full forward/reverse scrolling of listing, incorporating insert/delete lines, insert/overwrite characters, enter line from any position after editing.
"No need to Sweat! Let me be your slave."
*REF, Produces a cross-reference listing of the current basic program. All variable names are listed (WITHOUT HAVING TO RUN THE PROGRAM!) in alphabetical order followed by the line numbers on which they are referenced. Numeric items can also be crossed referenced if desired.
*SORT, A built in sort routine allowing any single dimension array, be integer, real or string, to be sorted.
BASIC COMMAND LIST:- *PROG, *BAD, *EXTEND, *PACK, *SORT, *PAGE, *ENVELOPE, *FIND, *REPLACE, *XREF, *TRON, *TROFF, *CHAR, *EDIT, *EDKEY.
MACHINE CODE COMMAND LIST:- *MCODE, *MOVE, *CROM, *SLOW, *GET, *PHEX, *GO, *MON, *HEX, *SPACE, *DGET, *DISCED, *DIS, *DEBUG, *CRC, *REL.
Designed with the serious programmer in mind, a 16K Eprom packed with a multitude of programmer friendly utilities, as with all SLAVE'S, SLAVE is instantly available and will obey an extensive range of commands. So why not invest on more muscle for your BEEB, and get some help with the heavy work!!! SLAVE has over 30 comprehensive machine code and basic tools.
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Please allow 14 days for delivery.

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Telemod 2

OEL's Telemod 2 is a V23 modem which, in addition to viewdata, offers half duplex user-to-user communication at 1200 bits/second both ways under appropriate software, available for the BBC on cassette, disc or ROM.

A classic 'black box' unit, measuring 167 × 233 × 54 mm, it has an upper surface sized to take either a standard 'perpendicular' telephone or a more modern BT Statesman-type receiver.

The modem has a telephone socket in the back panel, and the literature thoughtfully pays attention to arranging the equipment tidily. Controls in the front panel are a sliding switch to select the mode – Prestel, user-to-user or self-test – and a toggle switch to go on line. Coloured LEDs monitor power, carrier and line.

The Telemod 2 is simple and straightforward to use. Perhaps this is one of the reasons why OEL acoustic and hard-wired modems are supplied as standard equipment with the Micronet 800 package deal.

I received only a proof version of the user guide, which contained instructions, technical specification and description of file and program transfer in user-to-user mode.

Which one for you?

Before rushing out to spend your money, make a list of the features you require in a modem. Don't underestimate by looking only at today's needs – try to visualise what you might want in twelve months' time. Try to differentiate between real necessities and features which are simply convenient.

It's difficult, but it's better than regretting an impulse buy. For example, auto-dialling is convenient but not necessarily good value, bearing in mind that today more and more telephones have a last number re-dial facility: This is typical of the decisions to be made, and no-one is in a better position to decide than the person spending the money.

SCM-100 Loco Systems, 5 Stainton Walk, Goldsworth Park, Woking, Surrey GU23 1JB. Tel: (0462) 4480.
Nightingale Pace Software, 92 New Cross Street, Bradford BD5 8BS. Tel: (0274) 729306
PAC-M1 Telemod 2 OEL, North Point, Gilwilly Industrial Estate, Penrith, Cumbria CA11 9BN. Tel: (0768) 66748
Prestel Adaptor Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN. Tel: (0223) 245200
Protek 1200 Protek Computing, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian EH54 9BX. Tel: (0506) 415353

On the right track

'3D Grand Prix', Software Invasion, BBC, £9.95 (disc £11.95)

IF you attended the *Acorn User* show last August you may have had a sneak preview of this game on the Software Invasion stand.

As the title suggests, the scenario is a race track – Silverstone to begin with, and the target is to finish in the top four and move onto the next circuit.

Using keyboard or joystick you signal that you are ready to start, the red lights change to green, you move into gear and off you go.

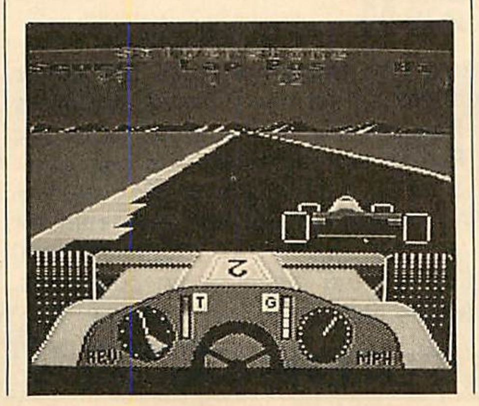
The 3D aspect of the game is now apparent. As I moved off, the edges of the track slipped by, while other meaner machines whizzed past and into the distance and I dropped steadily back through the ranks.

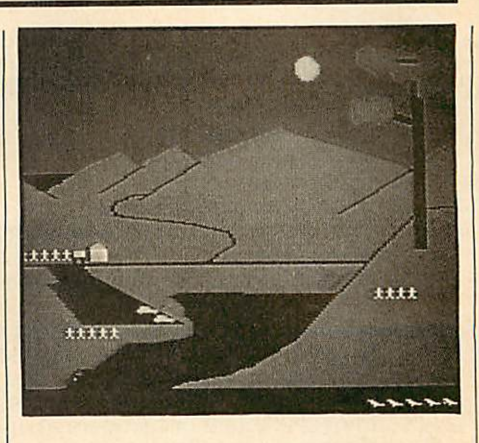
The first corner approached and I started to slip off the track – the engine's whining, so throttle back to stay on course, but it was too late – I hit a bollard.

Overtaking other competitors isn't very easy as they tend to hog the road in front of you and the race track isn't wide enough to allow you to pass in comfort. Each lap completed is signalled by a loud ping.

The biggest disappointment is the lack of the usual track-side hustle and bustle. While pits and grandstands may be beyond the memory of the Beeb, the omission of at least a starting/finishing line is amazing.

Sound effects are good, with over-revving, high-speed cornering and gear-changes all unmistakable. As a challenge, *3D Grand Prix* is competitive and after three hours practice I was just scraping into the top eight positions, but also getting a little bored. The graphics are some of the best I've seen for this sort of game, but are sometimes disappointing for their lack of real detail. **Bruce Smith**





Learning with the birds

'Osprey!', Bourne Educational Software, BBC and Electron, £9.95 (disc £11.95)

A SIMULATION on the same lines as the Welcome Tape's 'Kingdom', the player's aim in *Osprey!* is to safeguard and increase the population of that bird in Scotland. It is a rare bird of prey which lives by fishing, and a very interesting booklet is supplied with the package describing the osprey's habits and history.

The resources available to the player are wardens, who must be allocated to minimise disturbance to the nesting birds. Decisions are made in the spring and summer, and their consequences carried over into the following season.

The program displays its results with sound and graphics: there is an attractive (but unvarying) landscape, the birds fly, sing and splash into the lake, egg stealers climb the tree or are chased away by wardens.

The game ends either when the osprey population has dwindled to zero or when year 1980 is reached (it is possible to begin at any time from 1965 onwards). Both endings are somewhat abrupt, and it is not possible to recall and analyse a series of decisions.

At the heart of a game like this is a 'model' – a set of rules which dictate the overall pattern of events generated by the program. Here the model is quite logical and simple, and it does not take too long to achieve reasonable results. The range of choices is obviously very limited, and the strategy need not vary greatly from one year to another. Used in the classroom the program would not require as much time and preparation as, say, the Ginn simulations.

In summary this is a well-presented package based on an interesting theme, which points the way towards further work and investigation away from the computer. **Susan Jones**

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George Hill examines two colour printers, then tells how your printers fared in our special benchmark tests

Seikosha Colour Printer (GP700A), £304.30 plus VAT.
Smith-Corona Fastext 80, £195 plus VAT.

A PRINTER reviewer's life is not a happy one – it's full of such trage-dies as no manuals, lack of tractor feeds and printers that suddenly stop working. This review of the Smith-Corona Fastext 80 and the Seikosha Colour Printer (GP700A) was fraught with just such dramas . . .

The Smith-Corona Fastext 80 has two graphics capabilities

When the Smith-Corona Fastext 80 was delivered, it came without connecting cable and with no mains plug. Fortunately, the cables I use for the Canon were suitable. Then the horror struck me – it didn't have a tractor feed. In its standard form the printer will take only cut-sheet or roll paper. Cut-sheet paper is a bore, and as there is no roll holder, I had to use fanfold paper with the friction feed mechanism in operation. This is always unsatisfactory as the paper 'creeps' and I end up printing on the roller, or the sprocket holes on the paper become entangled in the paper feed mechanism. I then read the unpacking instructions and fitted the ribbon. (This was a simple job but as the ribbon is very small I wonder how long it will last.) I gave it a quick test before reading the manual more carefully – a small glossy brochure, printed sideways for no apparent reason. Control and escape sequences seem like a *very* small subset of the Epson/Canon ones. I used the Canon test program as a basis for the trial.

I worked out a test program, and found the capabilities of this printer more limited than I thought. They are restricted to three sizes of print – normal (pica), elite and condensed. Each of these can be enlarged. There is no emphasised or double-strike printing, so you can't get bold print, and no italics. The only highlighting capabilities are enlargement and underline.

There are two graphics capabilities – single density, 480 dots per line and 'plotter graphics' with vertical and horizontal dot spacing identical, 576 dots per line – plotter graphics allows the drawing of round circles. Both use the ESC * m n1 n2 format used by the Epson FX series – m is restricted to 0 and 5. The general-purpose dump written for the Canon PW1080A should therefore work for these two modes.

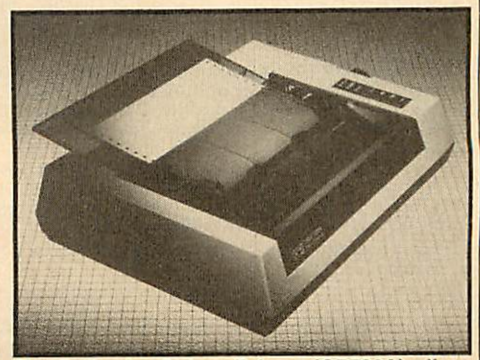
The Canon dump worked well on the Fastext 80. It really needed a pattern dump for the 'plotter' mode. As it was difficult to write a simple one using only four dots per pixel, and I couldn't be bothered to write a complicated one, I had to scan the screen sideways, and rotate dots in according to colour.

George Hill's listings to test these printers are on pages 109 to 112

The pattern dump works in Basic, but is not terribly satisfactory and is painfully slow! There are other frustrating features – no linefeed or formfeed buttons on the printer, and nothing to tear the paper off against – stupid on a printer clearly designed for roll paper.

When I tried to obtain final printouts of test programs, graphics dumps etc from the Fastext 80 the light failed to come on – the machine died on me! I thought it might be my mains plug or cable, so re-connected my Canon, but that was OK. Smith-Corona offered to replace it, but I asked them to wait until a tractor feed was also available. This untimely demise has rather clouded my judgement of the Fastext 80.

The Seikosha Colour Printer (GP700A) arrived for me to review without a manual. When I got one it was almost as uninformative as the one for the old GP100. They still have silly codes for repeated text and graphics, and different control codes, which are not even consistent within their own range, let alone compatible with anyone else's. The explanation of the colour graphics left me boggle-eyed. It



The Seikosha Colour Printer (GP700A) offers colour text and graphics

```
PRINTED ON SEIKOSHA GP700A.

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
The quick brown fox jumps over the lazy dog again in lower case

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{:}~ àâäéèêë#GB`Üü$ÄÅÖÖÜÇÇÖ¥£¢$↑↓←→PQRSTUVWXYZ[\]^_pqrstuvwxyz{:}~

BLACK MAGENTA RED PURPLE GREEN CYAN YELLOW BLACK AGAIN

Normal Width Double width Elite width Expanded elite.

01234567890123456789012345678901234567890123456789012345678901234567890123456789
                    ^TAB20                   ^TAB45

Start of linefeed test. Default linefeed of 1/6 inch.
1/8 inch linefeed, set by ESC B
1/3 inch linefeed, set as 40 units of 1/120 inch by ESC T40


Reset to 1/6 inch by ESC A.
End linefeed test.
```

Figure 1. The results of the test program (listing 4) on the Seikosha printer

is certainly not written for beginners!

I could not get the paper to feed into the Seikosha at first, so I had to take the top off and forage around inside. By some injudicious bending and insertion of screwdriver points I managed to clear an invisible blockage and get the paper in.

I then found that the thing was set for no auto-linefeed. It overprints everything on one line. If there's one thing I hate it's having to type *FX6 to set up the printer, as I always forget. I had to take the top off again to reset the DIP switch – why can't all manufacturers make this available from outside? Even the Fastext doesn't need a dismantling job to effect this change.

Once I got it to print I found the

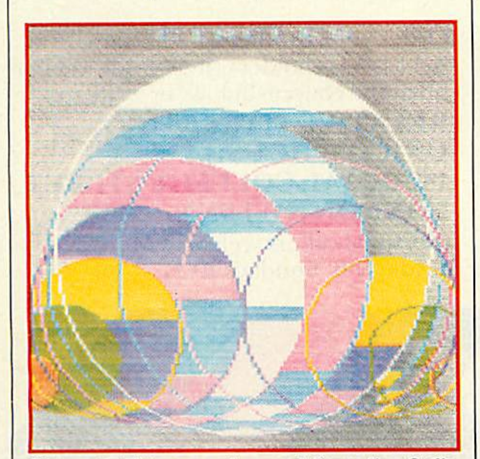


Figure 2. This was dumped from the Seikosha GP700A in one pass – the result is rather pale and stripey

character set is the usual awful Seikosha one, with pathetic one-dot descenders, but I'm really more interested in the graphics capabilities. This printer has immediate advantages over the Canon PJ1080A – it will accept normal fanfold paper, has a tractor feed, and the print style is not so intolerable as the Canon's. It's curiously arranged with its gaily striped ribbon diagonally mounted.

On reading the manual I discovered this is a very clever unihammer-type mechanism. I delved into the explanations of the various graphics codes, gaining little enlightenment from most of it. There is one command however (ESC C), which appears to offer the possibility of printing the whole screen very simply. You have to send the number of X and Y dots in the whole picture and then, one byte per dot, tell the printer the colour to print. This colour is in RGB form (see July *Acorn User*, page 165 concerning the Canon PJ1080A), and hence is derived by a simple POINT command from Basic to give the logical colour, or a two-stage process from machine-code to get the physical colour. This looked easy and took about ten lines of Basic, including REMs.

After I realised I had failed to enable the printer (disaster 1) and omitted the Escape character (CHR$ (27)) from my command string (disaster 2), the Basic dump (listing 1) worked well, if slowly, but gave a very blotchy effect.

I decided to write a machine code version to speed it up (listing 2), but it was still pretty slow. I discovered what was causing the blotchiness of the colour output – I had the head set right back, and the dot wires were not hitting the ribbon hard enough. Adjusting it improved the colour.

The Seikosha looks attractive, offers colour text and colour graphics and takes proper paper. I have reservations about the character set and text speed though. Its worst point is that it makes a noise like a thousand demented mosquitos – made much worse if you remove the lid.

My test program for the Seikosha (listing 4) produced some attractive diamond shaped bands in graphics (figure 1). I also devised some logical and physical colour dumps, and an interrupt-type dump (listing 3), which produced rather pale and stripy results (figure 2), so I put the printer into two-pass mode.

This improved matters, (figures 3, 4, 5), but the results were still stripy, especially on large areas of colour. The problem is with the inking of the ribbon – after some experimentation I found that I had one ribbon which printed the colours well, and one ribbon which printed the black well. Even swapping the inkers did not seem to improve matters, so I can only conclude that this is a quality control or design problem. It made the standard of the pictures disappointing compared with my expectations.

To sum up the Seikosha GP700A. It takes standard width (8.5in) fanfold paper using a fully adjustable tractor feed, and single sheet feeding using friction feed is also possible. Text-handling control codes are convenient, particularly the TAB. It has a reasonable character set, with one-dot descenders. Extra foreign characters are available, and character-set switching isn't necessary for # and £ signs. Its graphics capabilities are versatile with all colours printed in a single pass of the printhead, and a very simple RGB



Figure 3. Dumped from the Basic listing 1

printing mode for screen dumping. The push-button controls and easily-reached paper feed knob are useful features and it has a tilt-both-ways lid. The ribbon is easily changed with a re-inking facility, and it has a standard Centronics interface.

On the minus side, it is relatively slow in normal text printing use – certainly far below the stated speed of 50 cps. (I obtained a benchmark speed of 25.3 cps). It's noisy, especially if the perspex lid is raised or removed. Some inks are very pale, even with a new ribbon and after limited use. There is slight inaccuracy in the over-printing which makes red, green and blue more 'fuzzy' than the pure colours (yellow, magenta and cyan). The background

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I enclose a cheque for £ ______ or debit my Access/Visa card no ______

Name ______ Signature ______

Address ______

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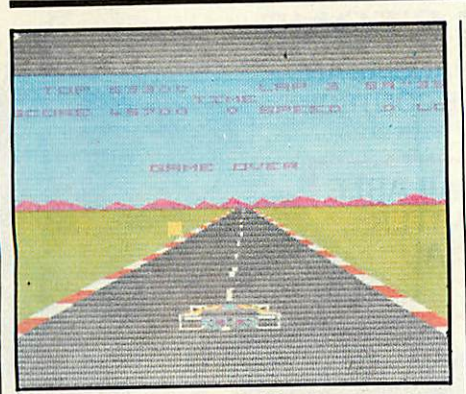


Figure 4. This 'Pole Position' screen was printed using listing 2 and cheating! (The screen memory was saved to disc after a break, then the image was fiddled with)



Figure 5. Mickey Mouse printed by listing 3 – note the changes in black and red when using a different ribbon

colour doesn't change when printing characters, so yellow is invisible in text mode. It produces a stripy effect in graphics mode – the dark blue is particularly purple (except when the ink runs out!), and the red is too orange. As there is no 'master reset' control code, you need to switch off and on again if interrupted while printing in colour. It has an idiosyncratic set of control codes, particularly for graphics, in which most numbers are sent as strings of ASCII digits.

Finally, how does it compare with the Canon colour ink-jet printer? It is better for text, and has much better paper handling, but the graphics are not so attractive. The Canon colours tended to be paler, but were totally even. The variability of the inking process on the Seikosha gives uneven colour density.

My overall opinion is that if you need a genuine dual-purpose text/graphics colour printer, neither of these is fully satisfactory.

• REAL TIMING •

What your stopwatches revealed in our printer trial

MANUFACTURERS' claims for the speed of their printers seem a bit exalted, if feedback from *Acorn User* readers is anything to go by. We asked you in the June issue to make your own timings and contribute your findings to a special printer benchmark table.

The response was very gratifying, and the results most interesting. Thanks to all those who replied – particularly P Gaunt, who wished us love and peace – the second commodity is in short supply at the office!

The table contains results for 37 new printers, and we have repeated the benchmarks obtained from those previously reviewed. I have no wish to point the finger at any manufacturer, but I must make the general point that *all* printer advertising claims appear to be highly misleading. Some, as the table indicates, are more misleading than others!

The test consists of timing *with a stop-watch* the printing of rows of alternating '*' and 'x' characters, generated by the program below. The printing speed is 2000/time taken. The result is in cps (characters per second).

We would still like to receive results for printers not covered so far. The instructions are repeated in the panel. Please do *not*

a) Use the TIME facility on the BBC micro. The results are rendered inaccurate by printer buffer size.

b) Send in a long letter describing how marvellous your printer is.

c) Enclose competition entries or any other letter in the same envelope.

Please *do* ensure the printer generates one linefeed per line – neither more nor less. If the program doesn't do this automatically (and in the majority of cases it will) then:

RUNNING INSTRUCTIONS

```
 10 REM Printer Benchmark
 20 REM Time taken to print
    25 rows of 80 characters
 30 VDU2,1,7,1,13
 40 FOR I=1 TO 25
 50 FOR J=1 TO 40
 60 VDU1;42,1,120
 70 NEXT
 80 VDU1,13
 90 NEXT
100 VDU1,7,1,13,3
```

1. Run the program, starting the stopwatch on the first beep from the printer, or on the printing of the first *.

2. Stop the stopwatch when the second beep is heard from the printer, or when the final x is printed.

3. Record the time taken.

4. Calculate the speed by the formula: speed = 2000/time.

- use *FX6,0 or
- alter the setting of the appropriate DIP switch or
- modify line 80 to 80VDU1,13,1,10

If your printer has less than 80 characters per line make sensible modifications, and enclose details of them with your reply.

The average printing speed obtained in normal use is between 50 per cent and 80 per cent of that claimed by manufacturers. This could influence your choice when buying a printer. My experience has been that any printing speed below a claimed 80cps – a benchmark of 55cps – is likely to prove irritatingly slow. This fact prejudices me against the suitability of daisy-wheel printers for the average user.

One reader commented 'Never mind the speed, feel the quality!'. There *are* circumstances where quality is more important than speed, but these are rarely relevant to the home user. The slowness of some printers is a positive disincentive to using them when programming or proof-reading, which really nullifies much of the advantage of having a printer. If letter quality print is of some importance, but not the overriding concern, there is a compromise. The Canon PW1080A and the OKI Microline 92 both produce letter quality print as an option (at a lower speed), but have very high speed print for normal purposes, and there will be other printers of this type. The Canon is the 'best buy' of the moment in my opinion, at under £350.

There are several ways in which slowness can be made more tolerable. One is by having a large printer buffer (memory in the printer, which allows the micro to send anything from a few characters to several pages of data to the printer at once). The printer now prints what's in the buffer, and, unless you fill it up, the micro becomes available almost instantly. To be a meaningful time-saving device the buffer needs to be of at least 2k, and 8k or 16k is better still.

Another is to have an 'interrupt driven' printer handler. This sends characters to the printer and fills up the output buffer on the micro, which is returned to you for normal use. When the buffer becomes empty, the micro is 'interrupted' in the background, and the output buffer is refilled, and control of the micro is returned to you again. The trouble with this is that the time and trouble spent setting the system up is rarely worth the time saved. It's better to let the printer tie up the micro for five minutes, and go for a cup of tea!

Two comments about the results. The first concerns the excellence of the reports we have received so far. I must congratulate our readers on their conciseness and accuracy. The second is about cases where a printer has been reported on by more than one user. (The record is held by the Epson RX80.) In these cases the results were very closely grouped, which leads me to believe strongly in the validity of the benchmark method. The RX80 results varied between 64.3 and 66.7cps – a quite insignificant difference in the context of the use of these results. We are *not* trying to produce the British Standard Printer Speed (though that's not a bad idea), merely to give our readers a realistic idea of what to expect in day-to-day use.

Of all the reports we received on dot-matrix printers, there were few which would not have benefitted from either a new ribbon or a service, or both! Would yours?

HOW YOUR PRINTERS PERFORMED

Manufacturer	Model	Type	Speeds in cps Claimed	BM
Brother	CE50/51	DW	13	7.9
	CE60	DW	13	8
	HR15	DW	13	8.8
	EP22	DM	17	10.5
C Itoh	FP1500-25	DW	25	19.6
Canon	PW1080A	DM	160	100
		(NLQ)	27	25·7
	PJ1080A	IJ	37	30.5
Centronics	739	DM	100	45
Cosmos*	80	DM	80	56
Epson	MX80/100	DM	100	64
	RX80	DM	100	65
	FX80	DM	160	92.2
IDS (Integral Data Systems)	440 (Paper Tiger)	DM	67	56
Inforunner	Riteman	DM	120	78
ITT	3351	DM	80	57.3
Lucas	LX80	DM	80	57.7
Mannesman-Tally*	Spirit 80	DM	80	58.5
	MT80	DM	80	50.19
NEC	PC8023BE-C	DM	100	63.5
	PC8023BE-N	DM	120	74
OKI	Microline 92	DM	160	117
		(CQ)	40	28
Olivetti	JP101 (Spark Jet)	IJ	66.7	62.5
	Praxis 35	DW	12	4.8
Qume	Sprint 9/45	DW	45	29.7
Ricoh	RP1600	DW	60	34.4
Seikosha	GP100(II)	DM	50	32.5
	GP250X	DM	48	35.6
Silver-Reed	EXP200	DW	14	10.5
Smith-Corona	EL2000	DW	—	8.7
Star	DP510/515	DM	100	72.6
	Gemini 10X	DM	120	75.5
	Delta 10	DM	160	96.7
Sanple	Daisy-Step	DW	18	10.5
Tandy	DMP100	DM	50	35
	CGP115	PL	12	7.6
Walters	WM2000	DM	120	107
Shinwa*	CP80	DM	80	58

Notes

(1) DM = Dot-Matrix, DW = Daisy-Wheel, PL = Plotter, IJ = Ink Jet, CQ = correspondence quality

(2) From the figures and the printouts I suspect that the printers marked * have identical printer mechanisms.

SEND IN

1. Your name and address.
2. The maker's name, model number of the printer and price.
3. Type of printer (dot-matrix, daisy-wheel etc). Please state if the printer is also a typewriter.
4. Manufacturer's quoted speed from the manual or advertising.
5. The printout produced by running the program.
6. The time taken, and your calculated speed in cps.

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BBC Power 6 way to 2 Disc Drive 4 way 1.2mt		@ 4.60c ea

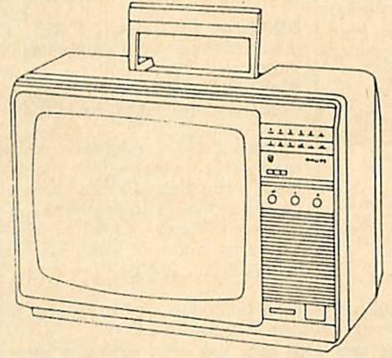
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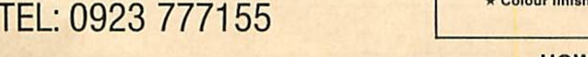
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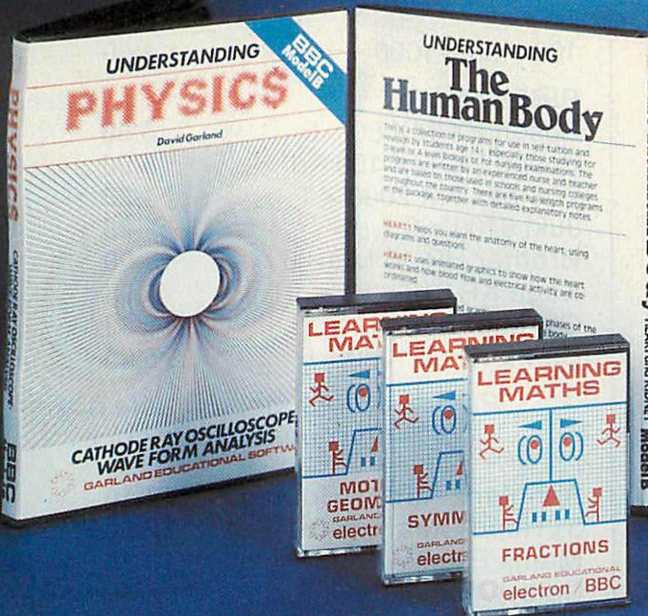
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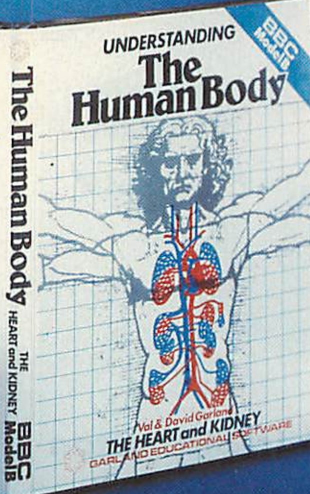
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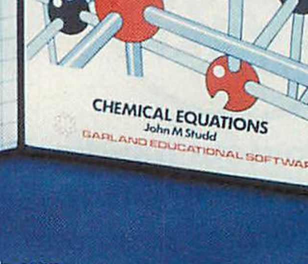
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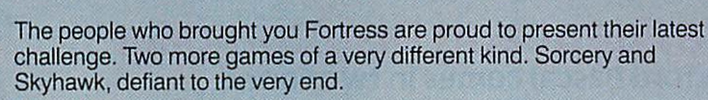
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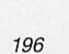
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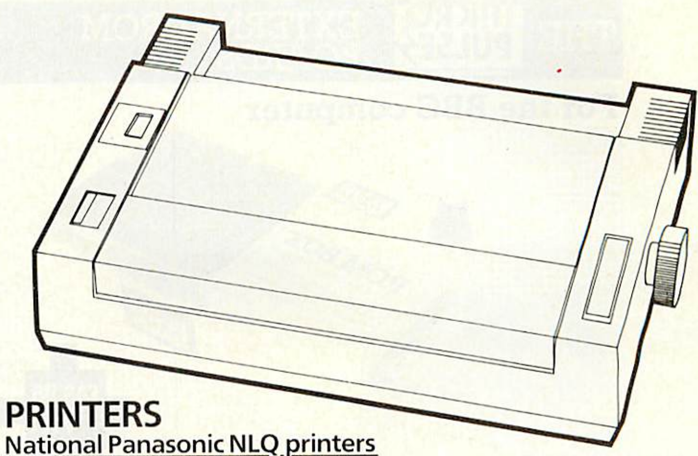
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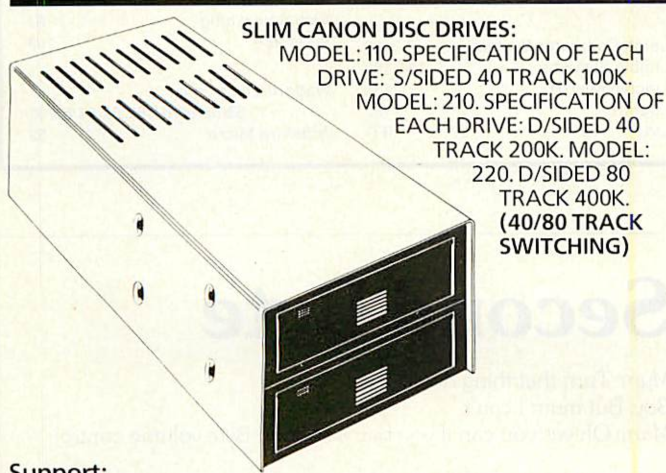
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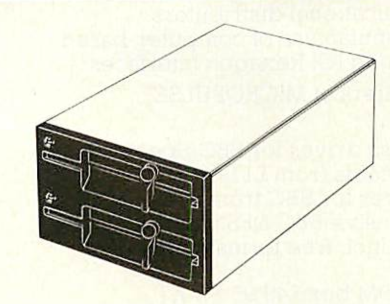
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ACORN ABUSER'S Diary

New Year Resolutions

AT THE last Acorn board meeting of 1984 the following New Year resolutions were made:

Hermann Hauser: Not to buy more than one corporation a month.

Chris Curry: To fill in my diary before going to bed; so that I know what happened the night before.

Peter Wrong (Finance): To increase my Barclaycard spending limit to pay off my Access bills.

Jim Michelin-man (Manufacturing): To be nice to everyone.

Andy Hippy (Research): To corner all East Anglian drug supplies by breaking the Cambridge Ring.

John Headache (R&D): To keep a spare pair of glasses in the car.

Peter O'Keats (Sales): One job at a time.

Chris Wart (Publishing): To remember to leak major stories to *Acorn User* anonymously.

Ian Nibbs (Company Secretary): Not to sit on Hermann's knee in Board meetings.

Other resolutions:
Dear Kitty: To get a photo taken.
Bruce Smith: To buy a better spelling checker.
Robert McRaker: To learn to produce '£' signs on *View*.

Orson Fact seeks out 'Deep Dial' the Prestel buster

HOW about all those Prestel break-ins! Live wire hack Orson Fact has just spent two months in the underworld learning all the secrets. We cannot print actual names but we can reveal that the master-hack is 'Deep Dial' who prowls the networks late at night when the BT security guards have gone home.

Using this and other devious techniques to break Prestel, Deep Dial and accomplice Fungus the Bogeyhack send out electronic letter bombs.

According to Deep Dial the biggest heist is yet to come: 'Hackery is so advanced that we will soon take over any computer that is within twenty feet of a telephone.' Acorn Abuser advises either moving your telephone or armour-plating your computer.

Highland re-View

WHAT are the Soft Acorns doing with all those old *View* 1.4 chips which have been upgraded to 2.1? The official story is that they're used to pave roads in Silicon Glen, but sources close to the company suggest they are being saved to be reused for a new *View* product – *DejaView*.

Acorn refund!

WHERE'S the Plus 2? Deep told Orson he can't wait to Econet his Elk and tap into T Quill's pubs (short for publications – Ed) database. However, in the meantime we must make do with the latest Acorn Elk add-on, the Minus 1.

Those of you with the Plus 3 disc drive will have noticed a change. Without the Plus 3, the power cable plugs in the right side of the keyboard. The Plus 3 covers this power socket, takes its power from the mains and in turn powers the Electron.

This is where Minus 1 comes in. Inside the Electron is half a circuit board of now redundant power supply logic. Take a hacksaw and cut off the rear three inches of circuit board and case. (Be careful not to invalidate your warranty.) Now solder the Plus 3 directly to the back of the keyboard.

This has two effects. First, your system is much shorter. Second, you have some hardware left over, the Minus 1, which can be returned to Customer Services for a refund.

Read all about us in 'Microsoap'

WHAT'S Guy Kooney been getting up to recently? Taking a great interest in squirrels, it seems. Apart from phoning the illustrious Tony Quisling wanting 'quick ways to become Elite' (he's *obviously after* more free Acornsoft programs), he appears to be ripping off Abuser stories in that weakly computer trade rag *Microsoap*.

In the Diary column (hmmm) he's been writing articles about our very own Uncle Tom, but spelling Tom's name a variety of ways. Well, we wouldn't mind, imitation being the sincerest form of flattery after all, but in the same article as using our ideas he refers to Acorn Abuser as a gossip column!

We are proud to announce that the winner of the first Guy Cooney award for Journalistic Hypocrisy has been awarded to Mr Kuuny himself.

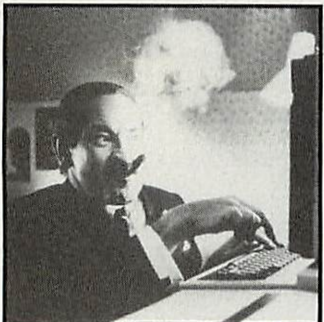
Not content with *Microsoap*, Crooney mentions in December's *PCW* a letter to Ms Cherry Hinton c/o Acorn. It was also mentioned in the new internal rag *Acorn News*. Now, where did I first see that letter?

New ad campaign

ACORN is to follow up its £4.5 million Christmas advertising campaign with an 'Ooh – £7 million at least' Easter campaign. Our mole inside Advertising leaked us some pictures and words. £7 million doesn't go very far it would seem – still only one actor – but as you can see Acorn is developing the Beeb theme by mixing old ideas with new.



'This is Dave. And this is his BBC micro. The same as thousands of juvenile delinquents use at detention centres – so it's nice to come home and wreck one all of one's own.'



Sound effects: Cough, cough.

'The trouble is that Acorn is also ideal for small-time hackers.'



Sound effects: dib-dib

'And twin floppies make it 'Bung-ho' for people like me.'



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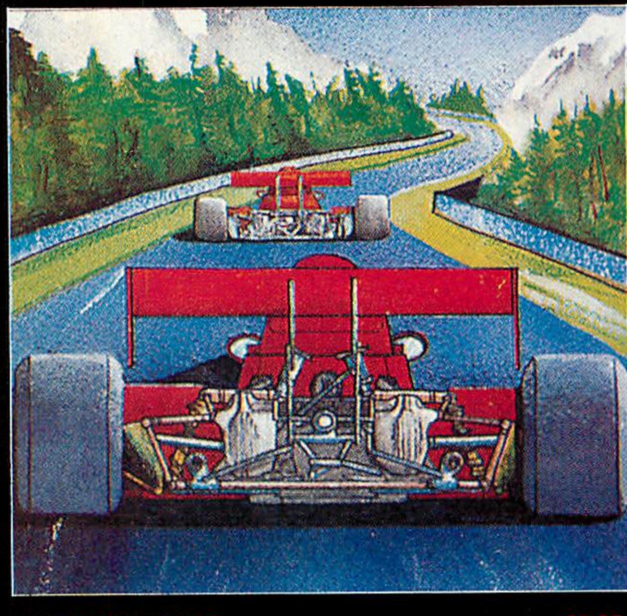








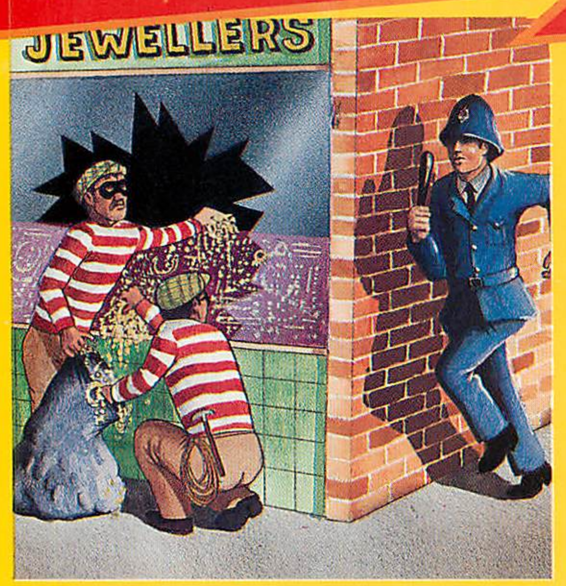


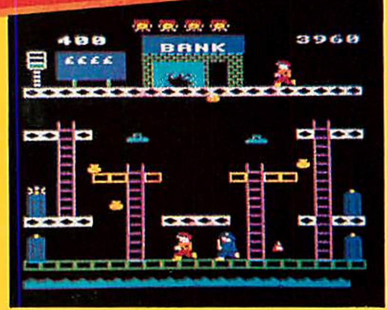


OVERDRIVE (32K) **£7.95**

A highly-addictive multi-stage 3D race game. You steer your car left and right, accelerate and decelerate as the opposing cars weave about the road. There are five different stages including night, snow, desert and riverside scenes. To qualify for the next stage, you must finish in the top twelve. Incredible graphics give the impression that you really are taking part in the race. Highly recommended, and destined to become another top-seller for Superior Software.

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An excellent and original arcade-style game in which you take the role of a robber aiming to snatch bags of gold from the bank. A policeman is after you ... he is able to jump at you or squat down and try to hit you with his truncheon. You must also keep clear of the flying police cones and floating dustbin lids. There are three fascinating screens of action including play streets with bouncing balls, one-way streets, conveyor belts, traffic lights and police-boxes. A novel and amusing game.

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